

it's
standard
at AMI

AMERICAN MICROSYSTEMS, INC.

FALL 1976
CONDENSED MOS PRODUCTS CATALOG

Ap 77

MOS/LSI is the business of AMI

. . . and MOS/LSI is AMI's main business. The first company to successfully produce commercial quantities of MOS circuits is 1966, AMI has ever since provided leadership in circuit design, manufacturing technology, and new product and market development.

DESIGN EXPERIENCE — the most extensive in the industry. Virtually every area of application in which MOS is used today was pioneered with an AMI-designed device. This accumulated experience results in imaginatively designed standard products that in many cases are significantly denser than similar circuits from other manufacturers.

PROCESS VERSATILITY — AMI's head start in the industry gives it a mature capability in every one of the major production processes. P-channel metal gate — high and low threshold, with and without ion implantation; P and N channel silicon gate; and CMOS silicon gate make up the company's repertoire.

PRODUCTION CAPABILITY — AMI has two major manufacturing facilities: Santa Clara, California with 332,000 sq. feet, and Pocatello, Idaho with 94,000 sq. feet. Assembly is done at a third major location — a wholly-owned 98,000 sq. ft. facility at Inchon, Korea. This complex of plants can produce over 3,000,000 LSI circuits a month. At all facilities AMI uses the latest production equipment, was the first to convert to 3-inch wafers, and now is leading in the conversion to the 4-inch size, in order to maximize yields of today's larger circuits.

PRODUCT RELIABILITY — Years of concentration on process control and a conservative attitude toward process changes has earned AMI an envied reputation of high reliability, and has enabled AMI to become one of the major suppliers of MOS memories to markets throughout the world.

IT'S STANDARD AT AMI — The company's dedication to a fine line of standard MOS/LSI products is reflected in the variety and number of state-of-the-art products listed in this catalog.

AMI and Made-to-Order MOS

Since 1966, AMI has designed and manufactured over 1,000 custom MOS circuits. The largest design engineering staff in the industry has helped to keep AMI in the number one position among custom MOS producers.

If your product can be controlled by an MOS circuit, and you plan to manufacture it in high volume, you should contact your nearest AMI Sales Office or the main office in Santa Clara, California. AMI will be happy to discuss the possibility of designing a custom circuit for your application, or manufacturing such a circuit from your tooling.

LCDs from AMI

Five years of experience in field effect liquid crystal display manufacture have helped AMI become a leader in this display technology. AMI formulates its own highly stable moisture insensitive liquid crystal materials that operate at 3 V ac drive.

AMI offers a comprehensive line of standard and custom watch displays (utilizing its proprietary AEA "continuous" digit process) and a series of large area displays for clocks and instrumentation.

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Industry Crossreference Guide

Device No.	AMI Replacement	Device No.	AMI Replacement	Device No.	AMI Replacement	Device No.	AMI Replacement
ELECTRONIC ARRAYS		INTEL		MOSTEK (Cont'd)		NATIONAL SEMICONDUCTOR (Cont'd)	
EA4600	S6831C	1103	S1103	MK4006	S4006	5233	S3514
EA5316	S1998A,B,C	1103-1	S1103-1	MK4008	S4008	MM5316	S1998A,B,C
FAIRCHILD		1103A	S1103A	MI4008-9	S4008-9	MM5384	S1998A,B,C
3514	S3514	1103A-1	S1103A-1	MK50240	S50240	MM5385	S1998A,B,C
35342	S1103	1103A-2	S1103A-2	MK50241	S50241	MM5386	S1998A,B,C
35345	S1103-1	2115	S4015	MK50242	S50242	MM5387	S1998A,B,C
3817	S1998A,B,C	2125	S4025	MK50380	S1998A,B,C	RCA	
6103	S1424A	2146	S146	MOTOROLA		TA6979	S1424A
93415	S4015	2316A	S6831A	MC6800	S6800	SIGNETICS	
93425	S4025	2316B	S6831B	MC6820	S6820	1103	S1103
GENERAL INSTRUMENTS		5101	S5101	MC6850	S6850	1103-1	S1103-1
AY-5-1013	S1883	8316A	S6831A	MCM6810	S6810	SMC MICROSYSTEMS	
R03-16,382	S8996	8316B	S6831B	MCM6830	S6830	COM2017	S1883
R05-8192	S8865	INTERSIL		M6860	S6860	TEXAS INSTRUMENTS	
CK-3300	S1998A,B,C	IM6508	S6508	NATIONAL SEMICONDUCTOR		TMS6011	S1883
HARRIS SEMICONDUCTOR		MOSTEK		MM5204C	S5204A	WESTERN DIGITAL	
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SELECTION GUIDES

Memories

Part No.	Organization	Process	T _{Acc} (ns)	R/W T _{Cycle} (ns)	Operating Power (mW)	Standby Power (mW)	Supplies (V)	I/O	Clocks	Packages
Random Access Memories										
S2222	512 x 1 Static	CMOS SiGate	200	470	7.5	0.002	+10	MOS	0	2H,1U
S2222A	512 x 1 Static		400	940	7.5	0.01	+10	MOS	0	2H,1U
S1103	1024 x 1 Dynamic	P-SiGate	310	580	450	—	+16, +19	MOS/Sense A.	3	2P,1P
S146	1024 x 1 Dynamic	P-SiGate	210	390	550	—	+19, +22	MOS/Sense A.	3	2P,1P
S1103-1	1024 x 1 Dynamic	P-SiGate	180	360	550	—	+19, +22	MOS/Sense A.	3	2P,1P
S1103X	1024 x 1 Dynamic	P-SiGate	120	270	550	—	+19, +22	MOS/Sense A.	3	2P,1P
S1103A	1024 x 1 Dynamic	P-SiGate	205	580	425	2.0	+16, +19	MOS/Sense A.	2	2P,1P
S1103A-1	1024 x 1 Dynamic	P-SiGate	145	340	660	0.2	+19, +22	MOS/Sense A.	2	2P,1P
S1103A-X	1024 x 1 Dynamic	P-SiGate	125	285	660	0.2	+19, +22	MOS/Sense A.	2	2P,1P
S4006	1024 x 1 QuasiStat	P-I ²	400	650	450	50	-12, +5	TTL	0	2H,4H
S4008	1024 x 1 QuasiStat	P-I ²	500	900	450	50	-12, +5	TTL	0	2H,4H
S4008-9	1024 x 1 QuasiStat	P-I ²	800	1000	450	50	-12, +5	TTL	0	2H,4H
S4015	1024 x 1 Static	N-SiGate	95	120	500	—	+5	TTL/Open C.	2	2H
S4015-2	1024 x 1 Static	N-SiGate	70	90	625	—	+5	TTL/Open C.	2	2H
S4025	1024 x 1 Static	N-SiGate	95	120	500	—	+5	TTL/3-State	2	2H
S4025-2	1024 x 1 Static	N-SiGate	70	90	625	—	+5	TTL/3-State	2	2H
S5101	256 x 4 Static	CMOS SiGate	650	650	110	0.05	+5	TTL/3-State	4	1C,2C
S5101-1	256 x 4 Static		450	450	110	0.05	+5	TTL/3-State	4	1C,2C
S5101-2	256 x 4 Static		450	450	110	0.7	+5	TTL/3-State	4	1C,2C
S5101-3	256 x 4 Static		650	650	110	0.7	+5	TTL/3-State	4	1C,2C
S5101-8	256 x 4 Static		800	800	110	2.5	+5	TTL/3-State	4	1C,2C
S5101L	256 x 4 Static		650	650	110	0.05	+5	TTL/3-State	4	1C,2C
S5101L-1	256 x 4 Static		450	450	110	0.05	+5	TTL/3-State	4	1C,2C
S5101L-2	256 x 4 Static		450	450	110	0.7	+5	TTL/3-State	4	1C,2C
S5101L-3	256 x 4 Static		650	650	110	0.7	+5	TTL/3-State	4	1C,2C
S6508	1024 x 1 Static	CMOS	460	730	50	0.5	+5	TTL	2	2H,4H
S6508A	1024 x 1 Static	CMOS	300	465	50	0.5	+5	TTL	2	2H,4H
S6810	128 x 8 Static	N-SiGate	1000	1000	650	N/A	+5	TTL	0	2L,1W
S6810-1	128 x 8 Static	N-SiGate	575	575	650	N/A	+5	TTL	0	2L,1W
Part No.	Description	Organization	Max. Power Dissip. (mW)		Supplies (V)	Max. Access Time	Process	Package		
Read Only Memories										
S3514	4096 Bit Static ROM	512, x 8 or 1024 x 4	512 x 8	500	+5, -12	1 μs	P-I ²	2L,1W		
S5204A	4096 Bit Static EPROM		512 x 8	750	+5, -12	750 ns	P-SiGate	3L		
S5232	4096 Bit Static ROM		500	+5, -12	1 μs	P-I ²	2L,1W			
S8564	9 x 7 Charac. Gen./ROM		64 Word	1100	+5, -12	450 ns	P-I ²	2I,1Z		
S8771	5120 Bit ROM		512 x 10	1000	+5, -12	450 ns	P-I ²	2I,1Z		
S8865	8192 Bit ROM		2048 x 4	635	+5, -12	1.3 μs	P-I ²	2L,1W(24);2I,1Z(28)		
S8996	16,384 Bit ROM		4096 x 4	368	+5, -12	1.8 μs	P-I ²	2L,1W(24);2I,1Z(28)		
S9996	16,384 Bit ROM		2048 x 8	368	+5, -12	1.8 μs	P-I ²	2L,1W(24);2I,1Z(28)		
S6830	8192 Bit Static ROM		1024 x 8	650	+5	575 ns	N-SiGate	2L,1W		
S6831	16,384 Bit Static ROM		2048 x 8	150	+5	450 ns	N-SiGate	3L		
S6834	4096 Bit Static EPROM	512 x 8	750	+5, -12	575 ns	P-SiGate	3L			
S6834-1	4096 Bit Static EPROM	512 x 8	750	+5, -12	750 ns	P-SiGate	3L			

Notes: All ROMs are mask-programmable for custom patterns to meet your requirements.

Communications Circuits

Part No.	Description	Word Length (Bits)	Max. Clock Freq. (KHz)	Input/ Output	Power Supply (V)	Process	Package
S1757	Asynchronous Receiver/Transmitter	5, 6, 7, 8	160	MOS	-12, $\pm$ 5	P-I ²	3M, 1T
S1883	Asynchronous Receiver/Transmitter	5, 6, 7, 8	200	TTL	-12, $\pm$ 5	P-I ²	3M, 1T
S2350	Synchronous Receiver/Transmitter	5, 6, 7, 8	500	TTL	+5	N-SiGate	3M, 1T
S2559	Digital Tone Generator	N/A	N/A	TTL-MOS	+3.5 to +13	CMOS	1U
S6850	Asynchronous Receiver/Transmitter	7, 8	800	TTL	+5	N-SiGate	2L, 1W

The AMI 6800 Microcomputer Systems Family

Part No.	Description	Input/Output	Power Supply (V)	Process	Package
S6800	Microprocessor, 8-bit (MPU)	TTL	+5V	N-SiGate	3M, 1T
S6800I	Microprocessor, 8-bit (MPU)	TTL	+5V	N-SiGate	3M
S6810	RAM, 128 x 8	TTL	+5V	N-SiGate	3L, 2L, 1W
S6830	ROM, 1024 x 8	TTL	+5V	N-SiGate	3L, 2L, 1W
S6831	16,384 Bit Static ROM	TTL	+5V	N-SiGate	3L, 1W
S6834	4096 Bit Static EPROM	TTL	+5, -12	P-SiGate	3L
S6820	Peripheral Interface Adapter (PIA)	TTL	+5V	N-SiGate	3M, 1T
S6820I	Peripheral Interface Adapter (PIA)	TTL	+5V	N-SiGate	3M 1T
S6850	Asynchronous Communications Interface (ACIA)	TTL	+5V	N-SiGate	3L, 2L, 1W
S2350	Synchronous Receiver/Transmitter (USRT)	TTL	+5V	N-SiGate	3M, 1T
S6860	0-600 BPS Digital Modem	TTL	+5V	N-SiGate	1W, 3L

Consumer Circuits

Series	Description	Digits	Power Supply (V)	Process	Packaging	
					Die	DIP (1T)
Watch Circuits						
S1408	Two-function LCD Watch/Clock (Hrs/Min)	3½	+1.5	CMOS	S1409	S1408
S1424A	Five-function LCD Watch (Hrs/Min or See or Month/Date with alternating time/date mode and voltage tripler display options)	3½	+1.5	CMOS	S1424A	S1427A
S11011	Six-function LCD plus alarm/chronometer/alternate time zone options	4	+1.5	CMOS	S11011	S11012
Part No.	Description	Power Supply (V)	I/O	Power Dis. (mW)	Process	Package
Clock and DVM Circuits						
S1856	LED/Gas D. Auto Clock (3½ digits)	+6 to +16	MOS	70	P-1 ²	1T
S1998A	50/60 Hz Line Clock (4 digits)-LED	+8 to +26	MOS	300	P-1 ²	1T
S1998B	50/60 Hz Line Clk.—Gas Discharge	+8 to +33	MOS	300	P-1 ²	1T
S1998C	50/60 Hz Line Clk.—Fluorescent	+8 to +26	MOS	300	P-1 ²	1T
Organ Circuits						
S2193	7 Stage Frequency Divider	-14, -28	MOS	300	P-1 ²	1D
S10129/30/31	6 Stage Frequency Divider ⁽¹⁾	-14, -27	MOS	350	P-1 ²	1D
S2555	7 Out Frequency Synthesizer	-15, -27	MOS	400	HI V _T	1D
S2556	6 Out Frequency Synthesizer	-15, -27	MOS	400	HI V _T	1D
S2566	Rhythm ROM	-15, -27	MOS	300	HI V _T	1W
S2567	Rhythm Counter	-15, -27	MOS	400	HI V _T	1D
S50240/41/42	Top Octave Synthesizer	-11, -16	MOS	360	P-1 ²	1U
S8890	Rhythm Generator	-12	MOS	400	P-1 ²	1T
S9660	Rhythm Generator ⁽²⁾	-12	MOS	400	P-1 ²	1Z
TouchControl-MOS Interface Circuits						
S9260/61	7-switch Interface	-13.5 to -18	MOS/TTL	200	P-1 ²	1C
S9262	14-switch Interface ⁽³⁾	-13.5 to -18	MOS/TTL	200	P-1 ²	1C
S9263/64/65	16-switch Interface	-13.5 to -18	MOS/TTL	200	P-1 ²	1T
S9266	32-switch Interface ⁽³⁾	-13.5 to -18	MOS/TTL	200	P-1 ²	1T

(1) Optional 7-stage divider, with different pinout, is available

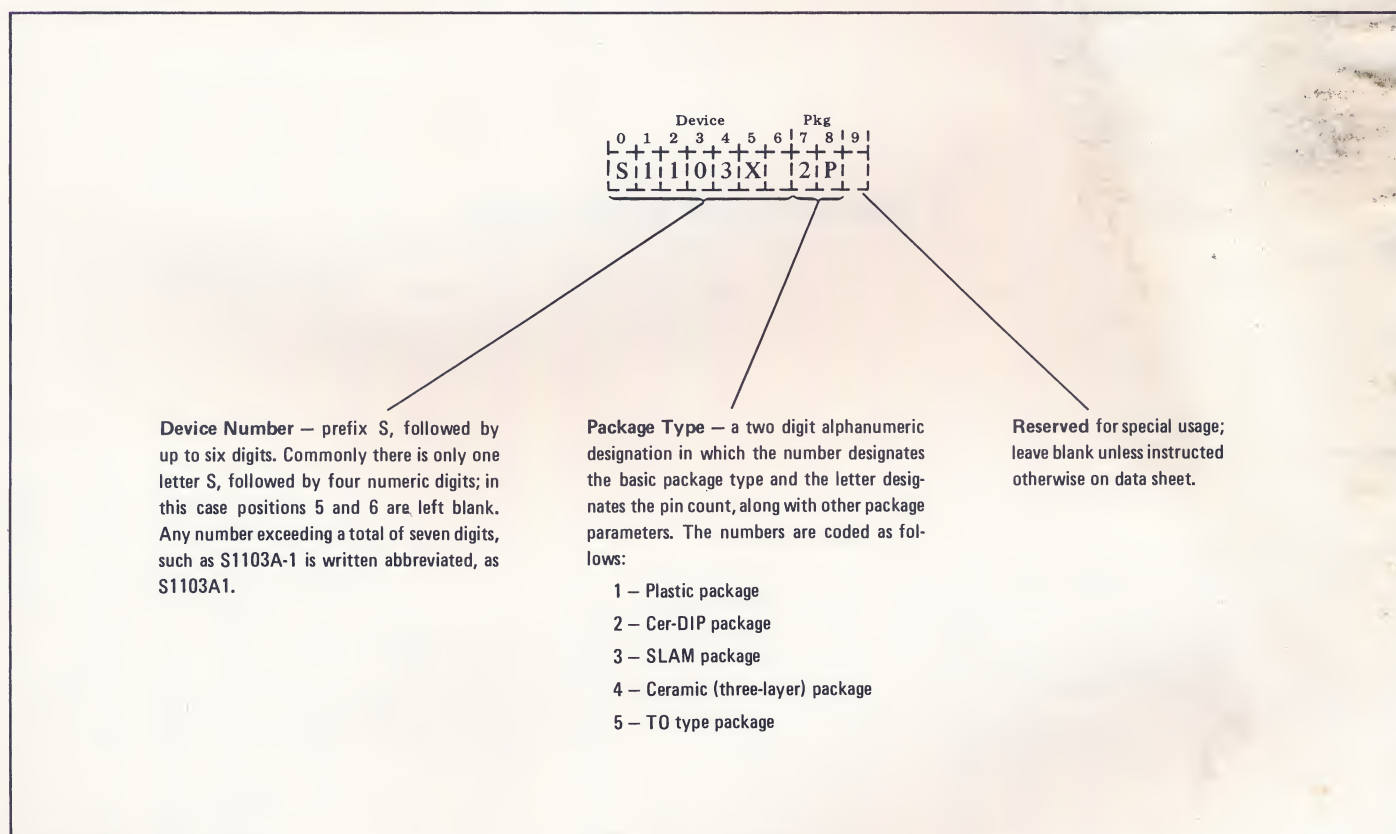
(2) Various pinouts available

(3) Output of this Interface Circuit is binary coded

ORDERING INFORMATION

Ordering Information

Any product in this Condensed MOS Products Catalog can be ordered using the simple system described below. With this system, it is possible to completely specify any standard device in this catalog with a 7 to 9-digit alphanumeric description, in a manner that is compatible with AMI's automatic order processing system. The example below shows how this ordering system works and will help you to order your parts in a manner that can be expedited rapidly and accurately.



All orders (except those in sample quantities) are normally shipped in plastic carriers or aluminum tube containers, which protect the devices from static electricity damage under all normal handling conditions. Either container is compatible with standard automatic IC handling equipment.

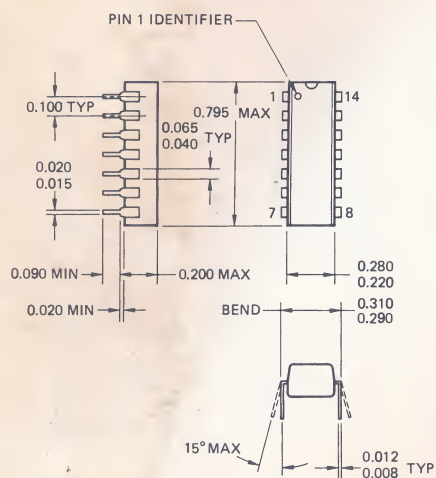
Any device described in this catalog is an AMI Standard Product. However, ROM devices that require mask preparation or programming to the requirements of a particular user, devices that must be tested to other than AMI Quality Assurance standard procedures, or other devices requiring special masks are sold on a negotiated price basis.

Information furnished by AMI in this catalog is believed to be accurate and reliable. Devices sold by AMI are covered by the warranty and patent indemnification provisions appearing in its Terms of Sale. AMI makes no warranty, express, statutory, implied, or by description regarding the information set forth herein or regarding the freedom of the described devices from patent infringement. AMI reserves the right to change specifications and prices at any time and without notice. Advanced Product Description means that this product has not been produced in volume, the specifications are preliminary and subject to change, and device characterization has not been done. Therefore, prior to designing any product into a system, it is necessary to check with AMI for current information.

Packages

1D

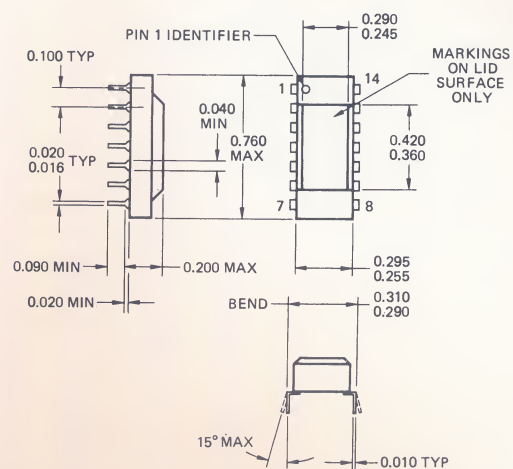
14-PIN PLASTIC



87684

4D

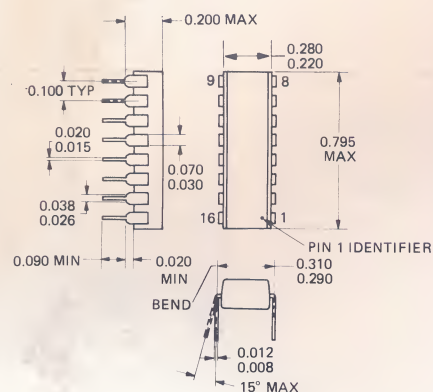
14-PIN CERAMIC



87685

1U

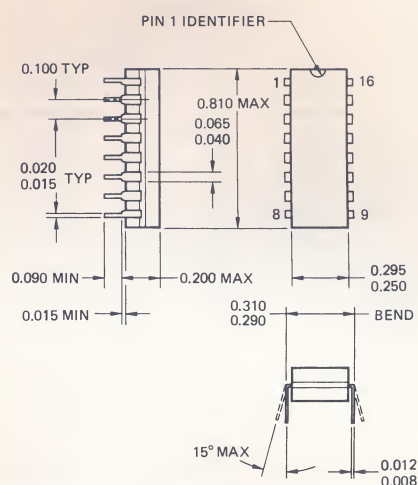
16-PIN PLASTIC



87686

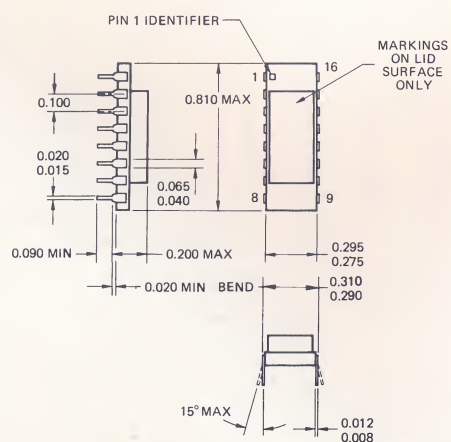
2H

16-PIN Cer-DIP



87687

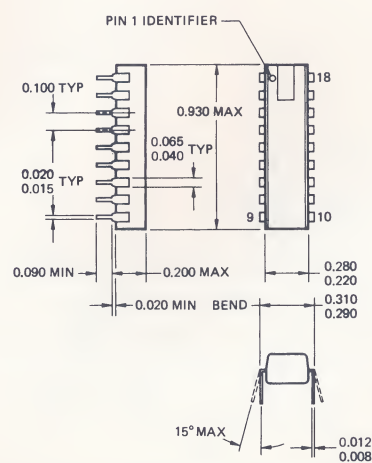
3H or 4H

16-PIN SLAM (3H)
16-PIN CERAMIC (4H)

87688

1P

18-PIN PLASTIC

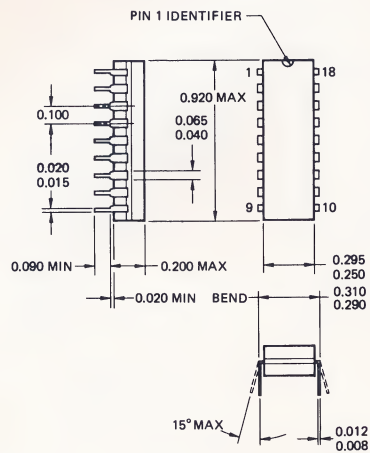


87689

PACKAGES

2P

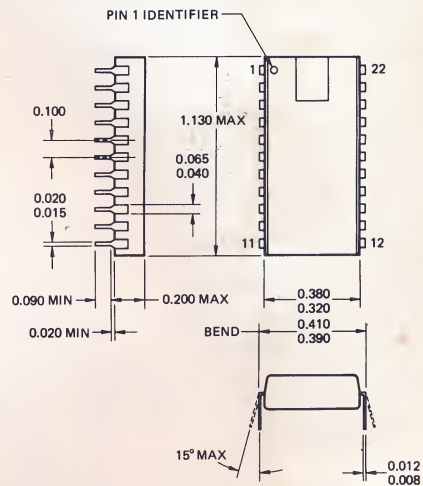
18-PIN Cer-DIP



87690

1C

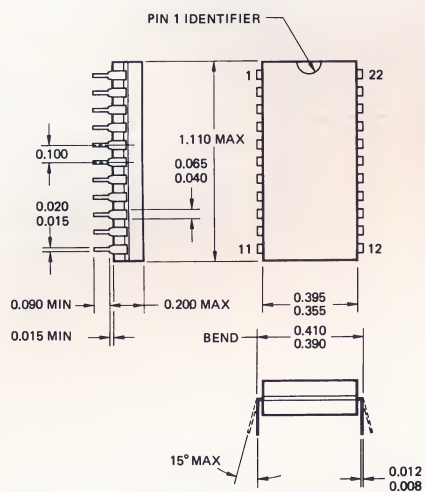
22-PIN PLASTIC



87691

2C

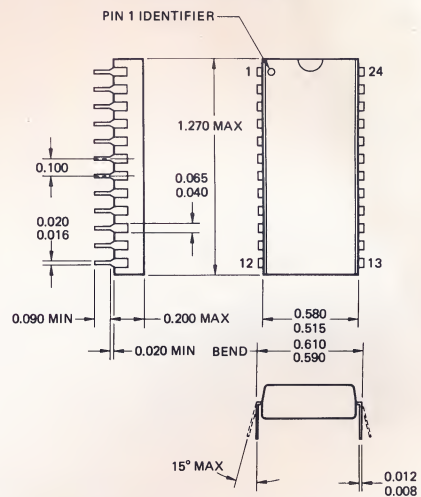
22-PIN Cer-DIP



87692

1W

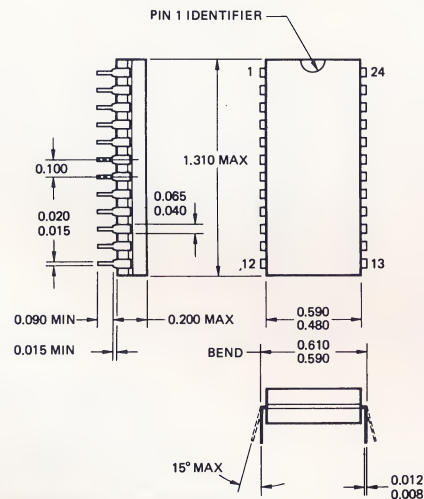
24-PIN PLASTIC



87693

2L

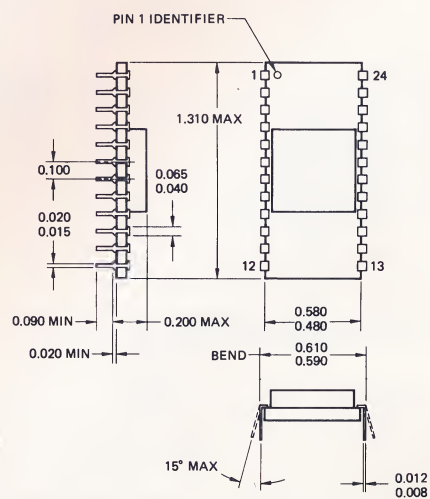
24-PIN Cer-DIP



87694

3L

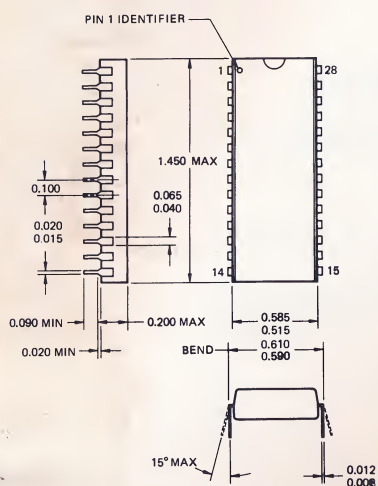
24-PIN SLAM



87695

1Z

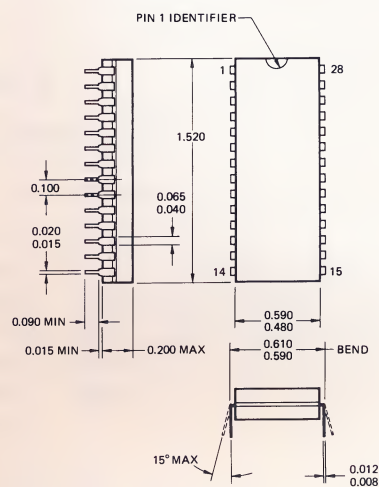
28-PIN PLASTIC



87696

2I

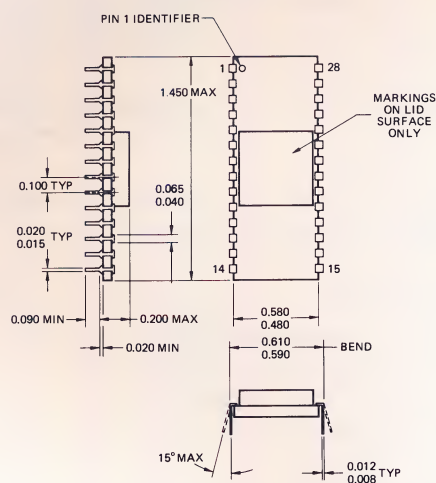
28-PIN Cer-DIP



87697

3I

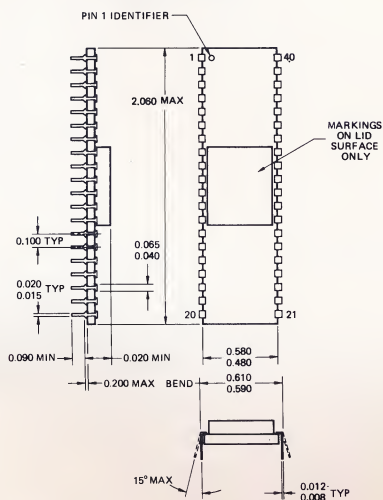
28-PIN SLAM



87698

3M

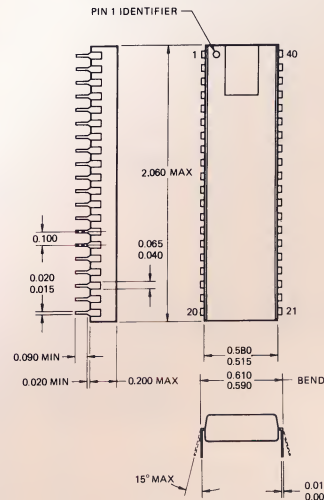
40-PIN SLAM



87699

1T

40-PIN PLASTIC



876100

Future Products

MEMORIES

- RAM — 1024 x 1 bit High Speed (45 ns), N-Channel, 16 pins
- RAM — 4096 x 1 bit Static, N-Channel depletion load
- RAM — 1024 x 4 bit Static N-Channel depletion load
- RAM — 16,384 x 1 Dynamic, N-Channel
- ROM — 2048 x 8 bit High Speed (less than 200 ns) N-Channel

COMMUNICATIONS CIRCUITS

- Auto Dialer (S2560) — a CMOS dialer with BCD display output; operates directly from telephone line.
- Tone Ringer (S2561) — a CMOS externally triggerable bell ringer simulator.
- Television Remote Control Transmitter/Receiver — a 2-chip set for a complete home television remote control unit.
- Analog Shift Register — a 185-stage delay line for audio and other analog signals up to 250 kHz.

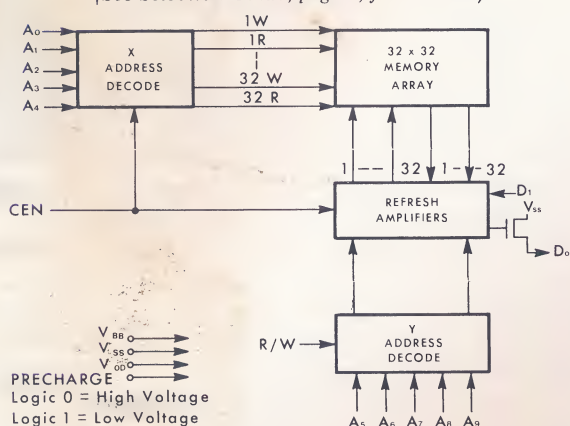
TIMING CIRCUITS

- Appliance Controller (S9274) — a versatile controller with internal ROM and RAM, wide variety of interfaces for external I/O and memory.
- Timer — a general purpose timer/clock circuit operating from 50/60 Hz.
- 4/6-Digit Line Clock — mask programmable per customer — specified feature set.

S1103/S146 Series

1024 x 1 RANDOM ACCESS MEMORY
(S1103A Series — same as shown below, except
there is no precharge clock.)

(See Selection Guide, page 4, for versions)

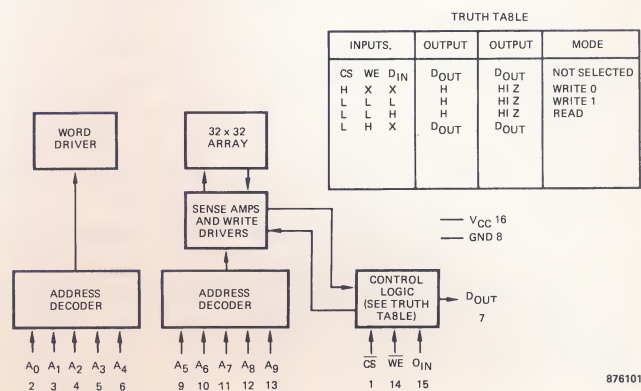


- Fast Access Time, 300/205/120 ns
- Performance Options Subject to Power Supply Levels
- Fast Cycle Time, 580/390/270 ns
- Full internal Decoding OR-tie Capability
- Chip Enable Provides Low Power Dissipation
- Simple Memory Expansion
- Inputs Protected Against Static Charge
- Refresh Period, 2 ms @ 0 to 70 °C
- Available in Packages 2P, 1P — see page 7

S4015/S4025 Series

1024 x 1 HIGH SPEED STATIC N-CHANNEL RAM

(See Selection Guide, page 4, for versions)



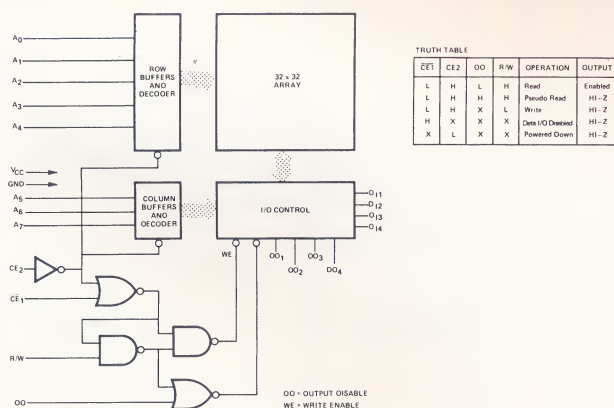
- Fast Read Access Time
S4015-2/S4025-2 — 70 nsec (Max.)
S4015/S4025 — 95 nsec (Max.)
- Fully Pin and Function Compatible with FCI 93415/93425 1 K Bipolar and Intel NMOS 2115/2125
- Low Operating Power Dissipation:
Typical 0.30 mW/Bit
- TTL Compatible Inputs and Outputs
- Single +5 V Supply (N-Ch. Si-gate Process)
- Open Collector (S4015) and Three-State (S4025) Output
- Low Cost Standard 16-pin Cer-Dip Dual In-Line Package 2H— see page 7

ADVANCED PRODUCT DESCRIPTION (Available 1st Qtr. 1977)

S5101 Series

256 x 4 STATIC CMOS RAM

(See Selection Guide, page 4, for versions)



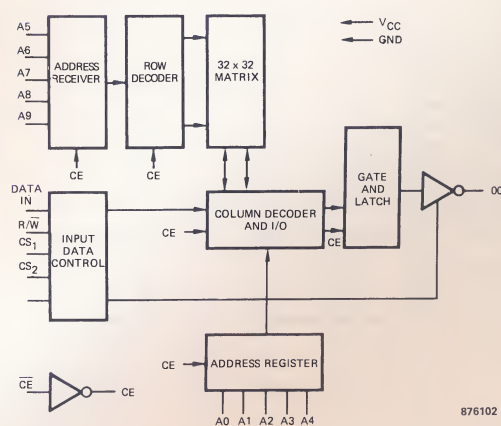
- Ultra Low Standby Power — 50 Nanowatt/Bit Max.
- Fast Access Time: 650 nsec Max.
- Single +5 Volt Power Supply
- Data Retention at 2.0 V_{CC}
- Pin and Function Compatible with Intel 5101
- Low Power Replacement for N-Channel Static 2101
- Three State Output
- Common or Separate I/O
- 22-pin Dual In-Line Packages 1C, 2C — see page 8

ADVANCED PRODUCT DESCRIPTION (Available 4th Qtr. 1976)

S6508 Series

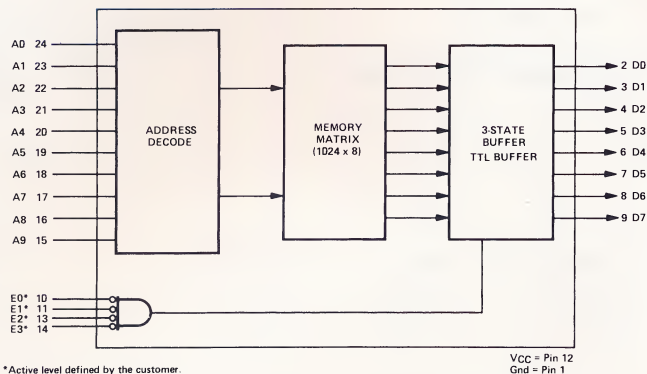
1024 x 1 HIGH SPEED STATIC CMOS RAM

(See Selection Guide, page 4, for versions)



- Low Power Dissipation
- High Access Speed: 460 ns std.; 300 ns max (A version)
- TTL or CMOS Compatible Inputs and Outputs
- V_{CC} can be from 4 to 11 V
- Static Operation
- On-Chip Address Register
- Pin Compatible with IM6508 Series

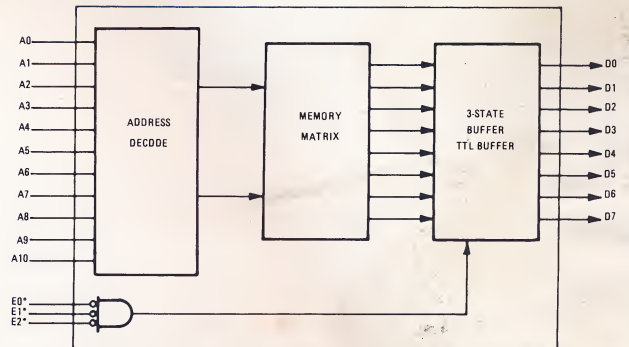
ADVANCED PRODUCT DESCRIPTION (Available 1st Qtr. 1977)

S6830**1024 x 8 READ-ONLY MEMORY**

*Active level defined by the customer.

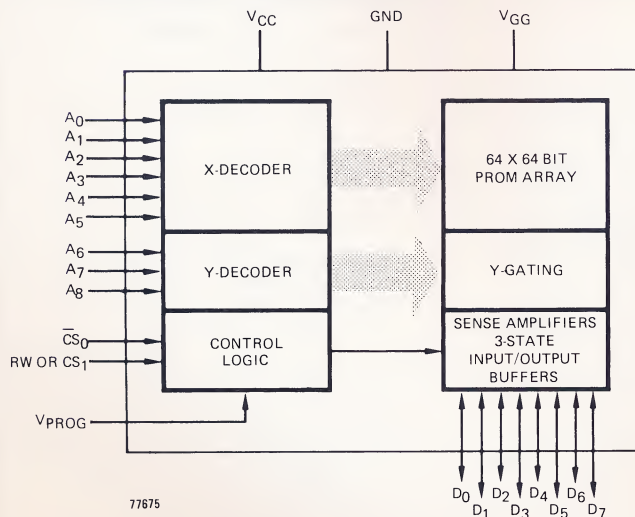
VCC = Pin 12
Gnd = Pin 1

- Organized as 1024-Bytes of 8 Bits
- Static Operation
- Three-State Data Output
- Four Chip Enable Inputs (Mask Programmable)
- Single 5-Volt Power Supply
- TTL Compatible Input/Output
- Maximum Access Time = 575 ns
- Available in Packages 3L, 1W – see page 8

S6831 Series**2048 x 8 READ-ONLY MEMORY**

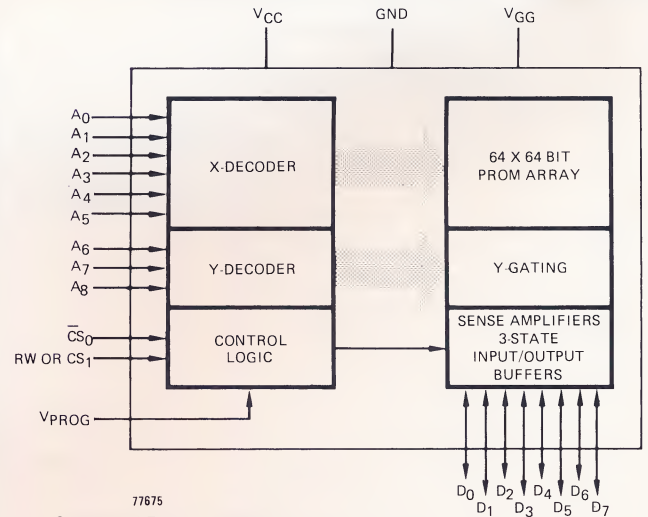
*ACTIVE LEVEL DEFINED BY THE CUSTOMER

- Pin Compatible with Intel 2316A/B, 8316A/B, and EA4600 (see Industry Crossreference Guide, page 3)
- Typical Power Dissipation – 150 mW
- Static Operation
- Three-state Data Output
- Three Chip Enable Inputs
- Operates on a Single +5 Volt Power Supply
- TTL Compatible Input/Output
- Maximum Access Time 450 ns
- Available in Package 3L – see page 8

S5204A**512 x 8 ERASABLE/REPROGRAMMABLE ROM (EPROM)**

77675

- On-Board Programmability
- Fast Access Time – 750 ns Max.
- High Speed Programming – Less than 1 Minute for all 4096 Bits
- Programmed with R/W, CS and VPROG Pin)
- Ultraviolet Light Erasable – Less than 10 Minutes
- Static Operation – No Clocks Required
- Three-State Data I/O
- Standard Power Supplies +5 V and -12 V
- Mature P-Channel Process
- Pin Compatible with MMS204C

S6834 Series**512 x 8 ERASABLE/REPROGRAMMABLE ROM (EPROM)**

77675

- On-Board Programmability
- Fast Access Time – 575 ns Max.
- High Speed Programming – Less than 1 Minute for all 4096 Bits
- Programmed with R/W, CS and VPROG Pins
- Completely TTL Compatible (Excluding the VPROG Pin)
- Ultraviolet Light Erasable – Less than 10 Minutes
- Static Operation – No Clocks Required
- Three-State Data I/O
- Standard Power Supplies +5 V and -12 V
- Mature P-Channel Process
- Pinouts Compatible with AMI 6800 Family

S6800 Microcomputer Systems Family

S6800 Microprocessor. The Microprocessor (MPU) is an 8-bit parallel processor. It contains an 8-bit arithmetic unit (ALU), two 8-bit accumulators, on condition code register, three 16-bit address storage registers, all of which are available for program use. In addition, there are the following non-accessible registers: a 16-bit address incremter/decremter, an 8-bit temporary register, and an 8-bit instruction register. There is also an instruction decode ROM and cycle control logic, interrupt and restart logic, bus control and halt logic, and a timing generator.

S6810 Static Read/Write Memory, 128 x 8. An N-channel MOS memory designed and organized to be compatible with the S6800 MPU. Its data, address and control line organization and functions match those of the MPU, all signal levels are TTL compatible, and no clocks or refreshing are needed. There are two versions of this memory: S6810 with 1.0 usec maximum access time, and S6810-1 with 575 nsec. maximum access time.

S6830 Read Only Memory, 1024 x 8. An N-channel MOS mask programmable read only memory that is used for storing the S6800 MPU operating programs. Like the S6810 RAM, this ROM has data, address, and control line organization that is compatible with that of the MPU. Its signal levels are TTL compatible and it can be accessed in a maximum of 575 nsec.

S6831 Read Only Memory, 2048 x 8. An N-channel memory — same as S6830, except has twice the bit capacity and 450 nsec access time.

S6834 Programmable and Erasable Read Only Memory (EPROM), 512 x 8. A high speed static MOS memory, erasable by ultraviolet light and electrically reprogrammable. It is designed to be compatible with the S6800 MPU bus structure and it is TTL compatible both during reading and programming.

S6820 Peripheral Interface Adapter (PIA). A general purpose programmable interface circuit that provides the means for most any kind of peripheral device or circuit to communicate with the S6800 MPU. The PIA has two 8-bit input/output ports for communicating with the peripherals and the MPU can program either port to send or receive data. Each port has two control lines associated with it. These also can be programmed by the MPU to handle interrupt and handshake routines with the peripherals.

S6850 Asynchronous Communication Interface Adapter (ACIA). A general purpose communications interface that allows an asynchronous serial communications device to transmit data to and receive data from a S6800 microcomputer system. The ACIA can be programmed for handling different word lengths at various data rates; it also has parity generation and checking capability. For interfacing with the S6860 modem, the ACIA provides three status and command lines.

S6860 Digital Modem. A 0-600 bps digital modem providing the necessary modulation, demodulation and supervisory control functions to implement a serial data communications link over a voice grade channel utilizing frequency shift keying (FSK) techniques. The S6860 interfaces directly to the S6850 ACIA.

S2350 Universal Synchronous Receiver/Transmitter (USRT). A general purpose communications interface that allows a high speed synchronous communications device to transmit data to and receive data from a S6800 microcomputer system. It connects to the peripheral device via separate serial transmit and receive lines and to the S6800 system address bus through an S6820 PIA.

The USRT has separate internal receiver and transmitter sections, which can be blocked by two separate clocks. It has the capability to handle different word lengths, generate and check parity and other conditions, detect sync during receive, and send a fill character during transmit operation.

AMI 6800 Microcomputer Hardware and Support Systems

AMI 6800 Microcomputer

(an LSI family of microcomputer parts, all complete levels, bus protocol, etc.)

S6800 Microprocessor (MPU) (8-bit Parallel)
S6810 128 x 8 Static RAM
S6820 Peripheral Interface Adapter (PIA)
S6830 1024 x 8 ROM
S6831 2048 x 8 ROM
S6834 512 x 8 EPROM
(Erasable and Reprogrammable)
S6850 Asynchronous Communications Interface
S6860 Digital Modem
S2350 Universal Synchronous Receiver/Transmitter
S5101 256 x 4 Static CMOS RAM

Cross-Product and Timesharing Software

(for AMI 6800 program development
on large scale computers and timeshare
networks.)

Prototyping and Evaluation Aids

(for circuit and program evaluation,
design development and simple
programming.)

EVK 300 Prototyping Board
EVK 200 Prototyping Board Kit
EVK 100 Prototyping Board Kit
EVK 99 Prototyping Board Kit

Cross-Assembler
(ANSI FORTRAN IV, also
available on National
CCS timeshare)

Linking Loader
(ANSI FORTRAN IV, also
available on National
CCS timeshare)

Simulator
(ANSI FORTRAN IV, also
available on National
CCS timeshare)

Applications and Customer Support

Applications Engineering
Microcomputer Workshops
and Seminars

Support Documentation

Hardware Reference Manual
Assembly Language Programming
Manual
Software Data Book
Product Brochures and Data
Sheets
Application Notes

Systems Family

Compatible in signal and load

Interface Adapter (ACIA)

Transmitter (USRT)

To take full advantage of microcomputers, look to AMI for the superior AMI 6800 family of microcomputer hardware and all the support you need to put it together. AMI offers everything from simple prototyping boards to the resourceful, convenient, and sophisticated Microcomputer Development Center, and some of the most advanced resident and crossproduct software in the industry. AMI offers total support — to make your product design and development task quick, economical, and reliable. It allows you to get your product on the market earlier and thereafter support it better.

Microcomputer Development Center (MDC)

(for complete and effective initial hardware and program development and systems integration; for subsequent product hardware and software expansions, customer support, incoming parts testing, and multiple other uses.)

Interface Modules

Quad Flexible Disk Interface
RS 232 Interface
Current Loop Interface
Printer Interface
Hi Speed Tape Reader Interface
EPROM Programmer AMI 512 x 8
General Purpose Peripherals Interface (User Defined)
Data Acquisition* A/D
Analog Output* D/A

Peripherals

Dual Disk Controller/ Dual Disk Drive (1 Min/2 Max)
TTY/Modem

Matrix Printer
Hi Speed Tape Reader

Memory Modules

16K Bytes NMOS Dynamic RAM
8K Bytes EPROM 8K Bytes ROM

Hardware Modules

Debug Extender
User Breadboard (Wire-Wrap Terminals)
EPROM Programmer AMI 512 x 8
Logic Analyzer*

Software Systems

Disk Operating and File Management System
Resident Assembler & Loader
Resident Text Editor
Debug Control
Resident Trace Program
Edit & Special Functions Control

*Planned Extension

AMI 6800 Microcomputer Development Center

What is the AMI 6800 MDC? An intelligent standalone software development and hardware debugging station, serving completely the combined needs of the design engineer and the programmer. It consists of a S6800 based CRT/keyboard microcomputer terminal, a dual drive floppy disc memory, and an optional hard copy printer.

A program in development (or in operation) can be viewed on the CRT and edited on the keyboard. Program files can be assembled and stored in the floppy disk memory, under control of the disk memory operating system software. The modular bus oriented card cage in the CRT terminal provides versatile facilities for developing and testing 6800 hardware.



CRT/Keyboard Terminal

- Capability for generating 256 unique ASCII input characters
- 12-inch diagonal CRT display – 25 lines, 80 characters per line
- 16 K bytes of user available RAM, expandable to 48 K bytes
- Full cursor and editing controls
- Special function controls
- Peripheral interconnects

Standard MDC Card Modules

- S6800 MPU Card
- EPROM/ROM Program Storage Card
- RAM Card
- Keyboard/Telecommunications Card
- Debug Card
- Peripheral Interface Card
- EPROM Programmer Card
- CRT Driver and Refresh RAM Cards
- Optional Edit Board

Floppy Disk Memory

- IBM 3740 data format compatible
- Data storage capacity of 256,256 bytes per diskette
- Provides instant on-line access to over 500,000 bytes and virtually unlimited removable media storage
- Fully supported by FDOS-II Disk Operating and File Management System software
- Two full-sector buffers enable completely asynchronous data transfer at rates up to 500,000 bytes per second
- Diskettes available from AMI and multiple other sources

Optional Matrix Printer

Completely self contained impact printer, 120 cps, sprocket-fed, handles paper widths from 4 to 9½ inches. Can print original and four copies. Standard print format is 10 characters per inch horizontal, 6 lines per inch vertical. Buffered, 75,000 cps parallel transfer, optional serial interfaces allow from 100 to 9600 baud serial transfer.

MDC Hardware Capabilities

The AMI 6800 MDC is a multifunction development center that single-handedly satisfies your requirements for software development, hardware development, and prototype checkout. The MDC can also double as a standalone communications terminal, a general purpose data processing system, or as an incoming parts tester.

Software Development — write, debug and operate S6800 programs on the CRT terminal, using its internal RAM and the dual drive floppy disc for storage. The MDC comes with a full complement of support software, including the FDOS-II Disk Operating and File Management System, a Text Editor, an Assembler, Debugger, Trace, Telecommunications and Utilities.

Hardware Development — breadboard such circuitry as interfaces or memories right on the MDC wirewrap prototyping board and plug into the CRT terminal card cage to operate with the MDC's S6800 based central processor in solving development problems. Use the control panel type functions of the CRT terminal for single step, stop-on-address, display, alter, and other similar program operations. The bus oriented

card cage, position interchangeable plug-in card modules, and an extender card provide the flexibility to make hardware development easy. There is also a complete keyboard controlled PROM programmer within the CRT terminal.

Prototype Checkout — with the advantages of a real-time test environment, rapid test program retrieval, single or multiple step execution, and hardware as well as software breakpoints, the checkout of prototype S6800 circuitry is easy and efficient.

Standalone Communications Terminal — the CRT terminal has both RS-232 and current loop interfaces, supported by telecommunications firmware, for operation as a general purpose standalone intelligent terminal, as well as to supplement microcomputer development on a timeshare computer.

General Purpose Data Processing System — with FDOS-II Disk-based Operating and File Management System and up to 1 megabytes on-line file storage, the MDC can readily be used for data processing and other computer applications.

Incoming Parts Testing — because card and chip substitution is easy in the MDC, it is convenient for testing all 6800 parts.

MDC Software Capabilities

The AMI 6800 MDC offers total facilities for rapidly developing applications and systems software. The entire MDC software system is at the user's instant disposal — a few simple keystrokes are needed to instantly access and execute any program. The FDOS-II disk based operating system provides complete system resource control to the programmer.

FDOS-II Disk Operating and File Management System — contains a resident module for bootstrapping the floppy disk memory and for disk I/O handling. It also contains an executive that performs all of the disk memory command line interpretations, file management and operational functions of the dual disk system. In addition, there are utility I/O and EPROM programming routines in FDOS-II.

The Text Editor — program provides the means for rapidly creating, examining and modifying stored files. The total capability of MDC's Text Editor exceeds that of many large minicomputer systems, and includes such features as string searches and string substitutions.

The Symbolic Assembler — translates assembler language statements into executable machine language code. In conjunction with FDOS-II Operating and File Management System, assembling has been reduced to a series of simple operator keystrokes. Results of the assembly, automatically stored on disk, are immediately available for reference or execution.

MDC's Extensive Debug Program — effectively automates the functions of a computer control panel. Given control by simply pressing the DEBUG key or via program traps, Debug immediately responds with the display of machine and program status. Additional functions include:

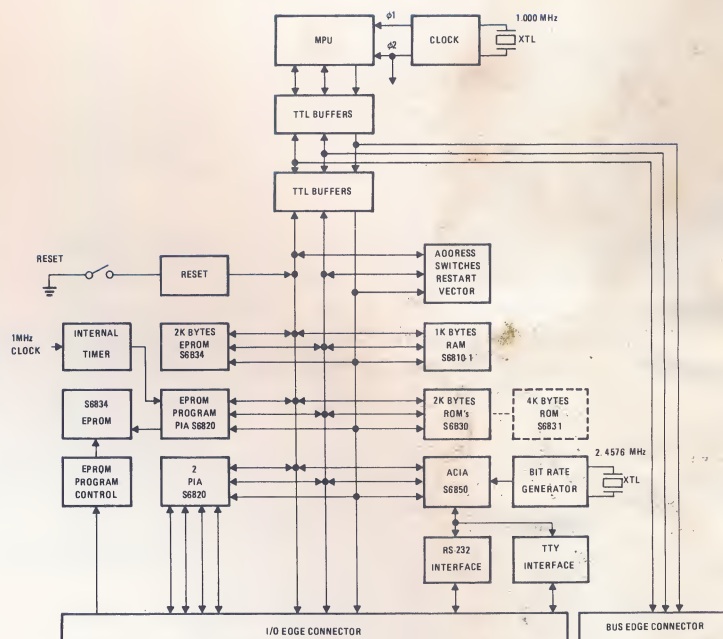
- Register/data display and modification
- Instruction/subroutine step
- User definable debug macros
- Snapshot debug data of a running program
- Breakpoints (stop-on-address compare)
- Comment and header line displays

MDC's Trace Package — gives Debug the ability to display a trace of machine register contents, instruction mnemonics and operands before execution of any instruction or subroutine in the user's program. Microprocessor debugging has never been made easier.

MDC's Test Programs — are a set of self-test and diagnostics which verify that the hardware associated with the MDC is operating correctly. The programs are also helpful in isolating malfunctioning components. The program for testing the basic hardware is resident in EPROM and is activated by the keyboard TEST key.

AMI 6800 MICROCOMPUTER SYSTEMS PROTOTYPING BOARDS

EVK Series Prototyping Boards



BLOCK DIAGRAM (EVK 300)

Features (EVK300 and EVK200)

- 2 K Bytes ROM (4 K using S6831)
- 2 K Bytes EPROM (EVK300)
- 512 Bytes EPROM (EVK200)
- 1 K Bytes RAM
- EPROM Programming for S6834
- 3 PIAs — 58 I/O Lines
- TTY Current Loop or RS232 Interface
- TTY Operating System Program
- ROM Subroutine Program Library
- Totally Buffered MPU Lines
- Single +5 V Power Supply except when using EPROMs or RS232 Interface
- Restart Address Selection
- Selectable DMA Mode
- Interval Timer

There are four versions of the EVK Series Prototyping boards:

EVK300 — fully assembled 10-½ by 12-inch circuit board, with all features listed above.

EVK200 — the same as EVK300, but in kit form.

EVK100 — a simplified kit, less the EPROM programmer, the auxiliary I/O on-board circuits (only the TTY interface), and other features

EVK99 — a minimum kit that includes only the circuit board and AMI MOS parts.

EVK Series Prototyping Boards provide fast and economical means for any user to operate a complete AMI S6800 Microcomputer with his own hardware, write and run test programs before committing any actual product design and programming time. Using this board designers and programmers can become rapidly proficient with the S6800 family of parts and then system development can take place more quickly and easily.

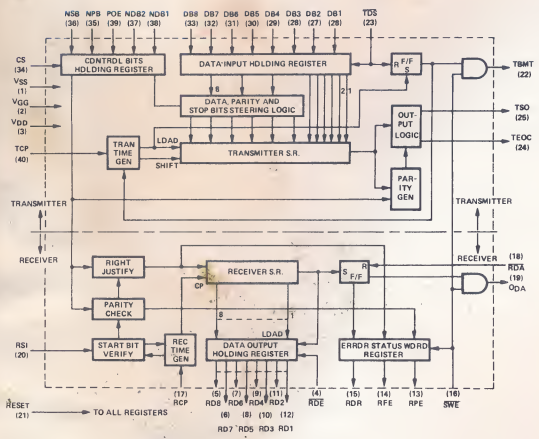
An EVK Series board can also serve as a general purpose microcomputer in low volume systems, because 58 I/O lines and buffered MPU data, address, and control lines are available at the edge connector for additional external memory or more I/O circuits.

A unique and most useful feature of the EVK 200 and 300 boards is the on-board EPROM programmer. The AMI S6834 4K EPROM can be programmed under MPU control from any RAM, ROM, or EPROM connected to the MPU bus and then be verified in the system.

Communication with the board is either thru a current loop interface, or an RS232C interface at any standard frequency. Three types of DMA operation are possible — halt processor, cycle steal, or multiplexing. The on-board generated system clock is adjustable from 300 KHz to 1 MHz and a separate interval timer provides 1 ms and 100 μs timing marks for general use.

Software provided on board includes the Prototype Operating System (PROTO) and a ROM Subroutine Library (RS³), both located in the S6830 or S6831 ROMs. The EVK300 also has a high level interpretive language, the AMI 6800 Tiny Basic, on it.

S1883

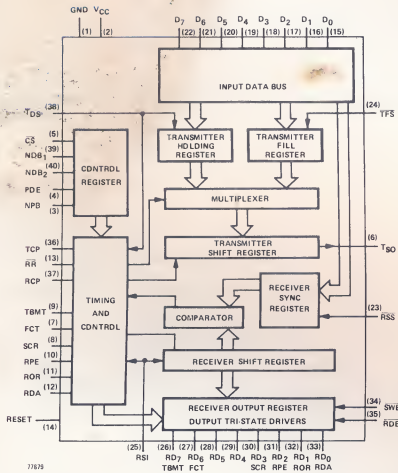


UART

- 12.5K Baud Data Rates
- 5-8 Bit Word Length
- Parity Generation/Checking
Odd, Even, None
- Framing and Overflow Error
Detection
- 1, 1.5, or 2 Stop Bits
- Double Buffered Input/Output
- Independent Transmit/Receive Rates
- Start and Stop Bits Generated and
Detected
- Interchangeable with TMS6011, COM2017,
TR1602, AY-5-1013
- Tri-State Outputs
- Available in Pkgs. 3M, 1T — see page 9

The S1883 Universal Asynchronous Receiver Transmitter (UART) is a single chip MOS/LSI device that totally replaces the asynchronous parallel to serial and serial to parallel conversion logic required to interface a word parallel controller or data terminal to a bit serial communication network. The UART will transmit or receive data characters of 5, 6, 7, or 8 bit length. Options allow the generation and checking of odd, even parity or no parity. The odd or even parity bit is automatically added to the character length for transmission.

S2350

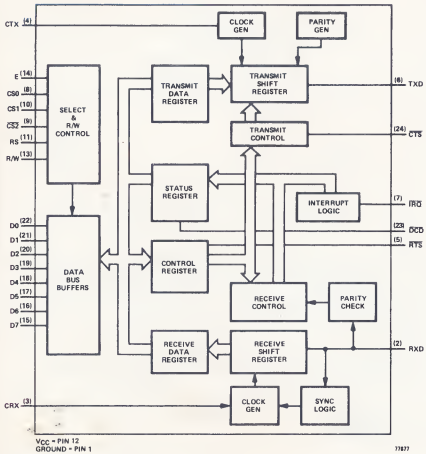


UNIVERSAL SYNCHRONOUS RECEIVER/TRANSMITTER (USRT)

- 500 KHz Data Rates; Internal Sync Detection
- Fill Character Register; Error Status Flags
- Double Buffered Input/Output
- Bus Oriented Outputs
- 5–8 Bit Characters; Odd/Even or No Parity
- Single Power Supply (+5v)
- Input/Output TTL Compatible
- Available in Pkgs. 3M, 1T – see page 9

The S2350 USRT is a single chip MOS/LSI device that totally replaces the serial-to-parallel and parallel-to-serial conversion logic required to interface a word-parallel controller or data terminal to a bit-serial, synchronous communication network. The USRT consists of separate receiver and transmitter sections with independent clocks, data lines, and status. Common with the transmitter and receiver are word length and parity mode. Data is transmitted and received in a NRZ format at a rate equal to the respective input clock frequency. Data messages are transmitted as a contiguous character stream, bit synchronous with respect to a clock and character synchronous with respect to framing or "sync" characters initializing each message. The USRT receiver compares the contents of the internal Receiver Sync Register with the incoming data stream in a bit transparent mode. When a compare is made, the receiver becomes character synchronous formatting a 5, 6, 7, or 8 bit character for output each character time.

S6850



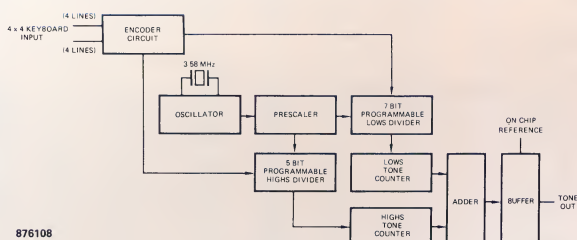
ASYNCHRONOUS COMMUNICATION INTERFACE ADAPTER (ACIA)

- 8 Bit Bidirectional Data Bus for Communication with MPU.
- False Start Bit Deletion
- Peripheral/Modem Control Functions
- Double Buffered Receiver and Transmitter
- One or Two Stop Bit Operation
- Eight and Nine-bit Transmission with Optional Even and Odd Parity
- Parity, Overrun and Framing Error Checking
- Programmable Control Register
- Optional $\div 1$, $\div 16$, and $\div 64$ Clock Modes
- Up to 500,000 bps Transmission

The S6850 Asynchronous Communications Interface Adapter (ACIA) provides the data formatting and control to interface serial asynchronous data communications to bus organized systems such as the S6800 Microprocessing Unit. The S6850 includes select enable, read/write, interrupt and bus interface logic to allow data transfer over an eight bit bi-directional data bus. The parallel data of the bus system is serially transmitted and received by the asynchronous data interface, with proper formatting and error checking. The functional configuration of the ACIA is programmed via the data bus during system initialization. Word lengths, clock division ratios and transmit control through the Request to Send output may be programmed. For modem operation three control lines are provided. These lines allow the ACIA to interface directly with the S6860 0-600 bps digital modem.

COMMUNICATIONS/ TELECOMMUNICATIONS CIRCUITS

S2559



- Very high accuracy – 3.58 MHz crystal reference
- CMOS circuitry – power directly from telephone lines
- Low Harmonic Distortion – 2% typical
- Mute and transmitter drives on chip
- Wide operating voltage – +3.5 to +13 V

TWO-OF-EIGHT DIGITAL TONE GENERATOR

This circuit generates eight different telephone signalling tones; two signal tones can be selected for simultaneous output. A 3.58 MHz reference frequency is generated on the chip and used to drive a prescaler. The prescaler operates on this reference frequency to derive more easily divisible frequencies for the programmable dividers. The programmable dividers count down the frequency derived from the prescaler in accordance with preset information derived from the encoder input. The encoder accepts 2 of 8 coded inputs from a 4 x 4 matrix type keyboard (common floating or at VDD).

Outputs from the programmable dividers cycle at N times the required tone rate, where N is the number of time segments used to synthesize a sinusoid. The present design uses 32 segments to synthesize a full sinusoid.

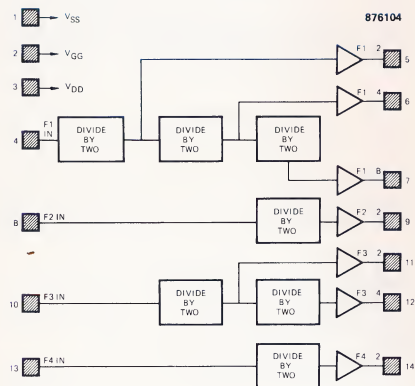
Tones thus derived are linearly added on the chip to achieve the required sum frequency. This signal passes through a buffer (bipolar), which allows proper impedance level transformation, thus preserving the signal level.

ADVANCED PRODUCT DESCRIPTION (Available 4th Qtr. 1976)

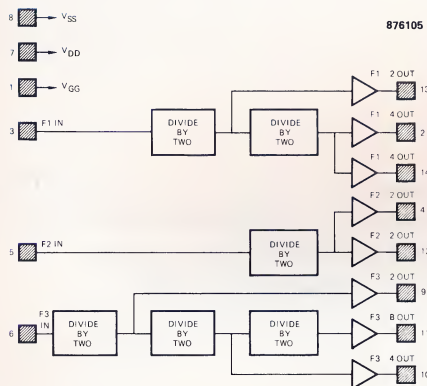
ORGAN CIRCUITS

S10129/S10130/S10131

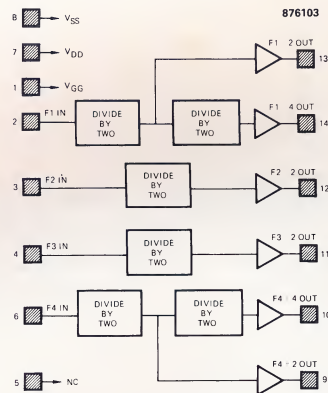
SIX AND SEVEN STAGE DIVIDERS



(S10129 Block Diagram)



(S10130 Block Diagram)



(S10131 Block Diagram)

- Replaces S2470
- Low output impedance
- Operates from DC to 100 KHz
- Electronic organ tone generation
- Available in Pkg. 1D – see page 7.

The S10129, S10130, and S10131 are divider circuits designed for use in electronic organs. Used in conjunction with AMI S50240, S50241, or S50242 top octave synthesizers, these dividers can generate all frequencies required for musical tone generation.

They have been designed with low output impedances for driving diode keyers, as well as other MOS systems.

Fabricated by the P-channel ion-implantation process, these dividers are packaged in 14 lead dual in-line plastic packages (1D, see page 7).

S50240/S50241/S50242

TOP OCTAVE SYNTHESIZER

2.00024MHz
CLOCK

CLOCK DRIVER

+ 451

+ 426

+ 402

+ 379

+ 358

+ 338

+ 319

+ 301

+ 284

+ 268

+ 253

+ 239

+ 478

Cg

Og

Og

Eg

Fg

Fg

Gg

Gg

Ag

Ag

Bg

Cg

Cg

OUTPUT DRIVER

- Single power supply
- Broad supply voltage operating range
- Low power dissipation
- High output drive capability

- S50240 – 50% output duty cycle
- S50241 – 30% output duty cycle
- S50242 – 50% output duty cycle
- Available in Pkg. 1U – see page 7

The S50240 is one of a family of ion-implanted, P-channel MOS, synchronous frequency dividers.

Each output frequency is related to the others by a multiple $12\sqrt{2}$ providing a full octave plus one note on the equal tempered scale.

TOP OCTAVE SYNTHESIZER

- Single power supply
- Broad supply voltage operating range
- Low power dissipation
- High output drive capability
- S50240 – 50% output duty cycle
- S50241 – 30% output duty cycle
- S50242 – 50% output duty cycle
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876106

RYTHM GENERATOR

TYPICAL APPLICATIONS

- Drives 9 Instruments
- 64 Bit Pattern
- 10 Rhythm Patterns per Instrument
- 5 Mask Programmable Reset Counts
- 7 Segment Count Display Output
- Internal Oscillator
- Available in Pkg. 1T — see page 9

The rhythm generator is a counter-ROM specifically designed for electronic organ and other electronic instruments. It contains an internal oscillator, a 6-bit counter, and a ROM that drives nine. rhythm instruments and also drives a seven segment sequence count display. The oscillator frequency is determined by an external network. The 6-bit counter has control inputs that allow the counter to reset at any one of five counts. Five reset counts are mask programmed to user requirements. The 64th count is normally programmed as the 5th reset selection option. The counter contains a start input that holds the system in the reset mode until a start command is impressed.

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 - 64 Bit Pattern
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S9660

RHYTHM GENERATOR

876107

- Organ Rhythm Sections
- Portable Rhythm Units
- Walking Bass
- Automatic Chord Timing
- Available in Package 1Z — see page 9

The S9660 Rhythm Generator is a counter-ROM, specifically designed for use in electronic organs and other electronic instruments. A total of nine rhythm patterns can be generated with this circuit, and each pattern is selected by a specific input, permitting the addition of rhythm patterns.

The S9660 contains an internal clock driver, a 6-bit counter, and a 4K bit ROM that drives 7 rhythm instrument generators. The 1K bit feature ROM provides four additional outputs that can be used to drive extra instruments or walking bass and automatic accompaniment circuits.

The 6-bit counter has control inputs that allow the counter to reset at any one of five counts. These counts, along with all ROM patterns, are mask programmed for user requirements.

RHYTHM GENERATOR

- Organ Rythm Sections
- Portable Rythm Units
- Walking Bass
- Automatic Chord Timing
- Available in Package 1Z – see page 9

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The 6-bit counter has control inputs that allow the counter to reset at any one of five counts. These counts, along with all ROM patterns, are mask programmed for user requirements.

WATCH/CLOCK CIRCUITS

AMI AND THE TIMING CIRCUIT MARKET

AMI is providing the expanding consumer watch and clock market with advanced as well as traditional product features, ranging from the original alarm and countdown circuits of the late 1960's to present mask-programmable circuits with the calendar, chronometer, timer and alarm features.

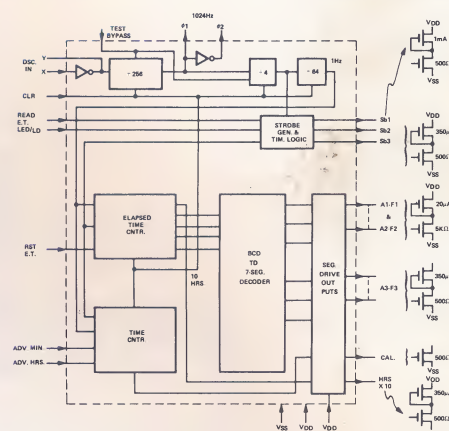
To help customers maintain a competitive price, AMI has pioneered MOS circuits that perform their functions with the least peripheral devices. For example, clock circuits that drive LED displays directly and on-chip voltage triplers which eliminate delicate, costly coils from watch modules.

AMI products continue this tradition of low cost in advanced as well as traditional features. The S1998 family of digital clock circuits provides direct drive for all popular displays: LED, LCD, fluorescent and gas discharge. The S1998 family also provides key features such as 59-minute countdown timer, snooze alarm, 12/24 hour modes, and others.

The S11011 multifunction programmable LCD watch circuit provides the best example of AMI's cost/performance philosophy: its features (setting sequence, display, etc.) are completely mask programmable, so that you can specify exactly the features you want in the circuit, and have parts in a few months. Previously, this would have required custom circuit development, high development costs and long delivery schedules. AMI intends to continue to provide unique advantages to its customers.

\$1856

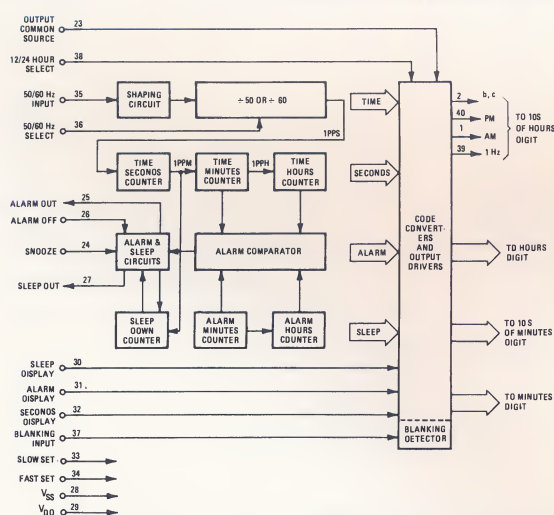
MOS DIGITAL CLOCK



- 20 Hr. Resettable Elapsed Time Counter
- Direct LCD or Gas Discharge Interface
- Electrically Selectable LED/MUX Output
- Minute and Hour SET Controls
- Separate Display Supply Allows Display Turn Off
For Reduced Battery Current Drain
- 1024 Hz Outputs For Voltage Doubler, Calendar
Advancing, or AM/PM Output
- Automotive Clock; Portable Clock
- Household Clock with Auxiliary Battery
- Appliance Timers; Industrial Timers; Photographic
Timers; Avionics Timers
- Available in Package 1T – see page 9

S1998A

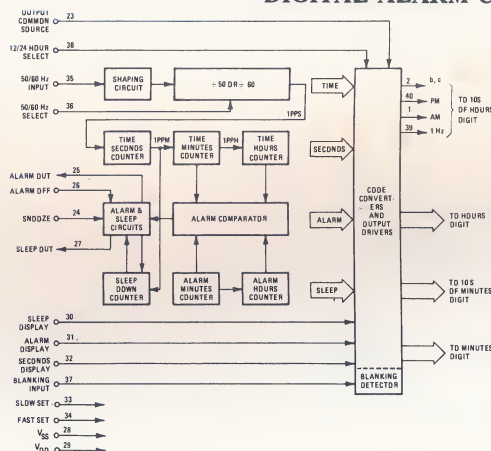
DIGITAL ALARM CLOCK



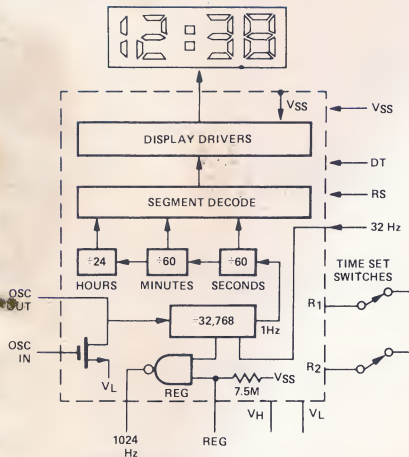
- Direct LED Drive (over 8mA per segment w/all segments on)
- AM/PM or 24-hour Outputs
- Power Failure Indicator
- Blanking/Brightness Control
- Pin Compatible with S1998, MM5316, EA5316, FCI3817
- Alternate to MM5384, MK50380, MM5385, MM5386, MM5387
- 50 or 60 Hz Inputs
- Alarm with Snooze
- Resets to 0:00:00 for Timer Applications
- Input Noise Rejection Circuitry
- Available in Package 1T – see page 9

S1998B/C

DIGITAL ALARM CLOCK



- Direct Drive for Gas Discharge Display (S1998B)
- Direct Drive for Fluorescent and Liquid Crystal Displays (S1998C)
- AM/PM or 24-hour Outputs
- Power Failure Indicator
- Blanking/Brightness Control
- Pin Compatible with S1998, MM5316, EA5316, FCI3817
- Alternate to MM5384, MK50380, MM5385, MM5386, MM5387
- 50 or 60 Hz Inputs
- Alarm with Snooze
- Presetable 50-minute Countdown Timer
- Resets to 0:00:00 for Timer Applications
- Input Noise Rejection Circuitry
- Available in Package 1T – see page 9

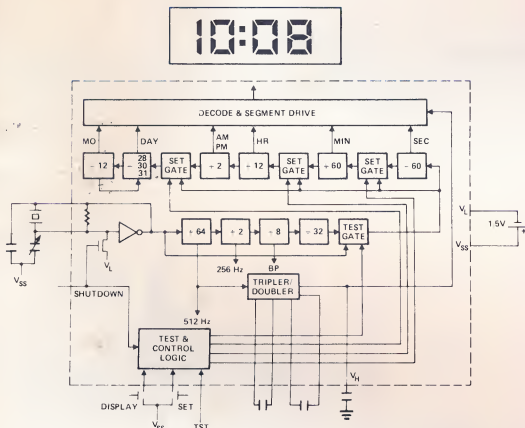
S1408/S1409**LCD WATCH/CLOCK (HRS /MIN , FLASHING COLON FOR SECONDS)**

- 12 or 24-hour Display
- Hours and Minutes Display
- Flashing Colon Display for Seconds
- 32 KHz Oscillator
- 1024 Hz Up-converter Output
- Internal Voltage Regulator
- Up to 12-volt output
- Operates from inputs as low as a single 1.5 volt battery up to 12 volts.
- S1408 – 40 lead DIP package 1T – see page 9
- S1409 – chip only

The S1408/S1409 is a low power timekeeping circuit that uses a single 1.5-volt battery to generate the direct drive signals for a 3 1/2-digit field-effect liquid crystal display. The circuit provides a 1024 Hz up-converter output and a 32 Hz display output. A flashing colon output is also provided with either a 24-hour or a 12-hour display mode.

The display drivers operate from a voltage up to 12 volts, generated from coil or transformer up-converter. The high voltage supply can be regulated by an external zener diode reference that gates the 1024 Hz output through the regulator input. Time set logic is provided to advance either the hours or minutes counters at a 1 Hz rate.

Silicon gate ion-implanted CMOS technology is used to obtain extremely low operating power and small circuit size.

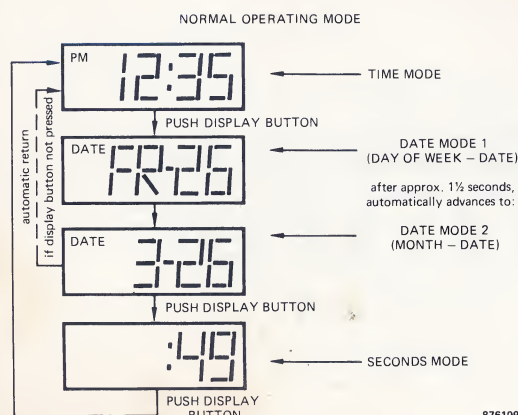
S1424A/S1427A**FIVE FUNCTION LCD WATCH (HRS/MIN, OR MONTH/DATE, OR SEC)**

- Display Hours/Minutes, Seconds, or Month/Date
- Automatic Four Year Calendar
- Direct Drive for Standard 3 1/2-Digit Display
- Voltage Doubler or Tripler LCD Drive Options
- One Pushbutton Controls Display
- Uses Single 1.5-volt Battery
- Additional Alternating Time/Date Display Mode
- Oscillator Shutdown Control
- High Speed Test Capability
- 32 KHz Oscillator
- S1424A – chip only
- S1427A – 40 lead DIP package 1T – see page 9

The S1424A/27A is a five function low power timekeeping circuit that uses a single 1.5-volt battery to generate the direct drive signals for a 3 1/2-digit field-effect liquid crystal display. Hours and minutes, or seconds, can be displayed continuously. Month and date are displayed when the display button is depressed. A continuous display alternating between hours/minutes and month/date is also selectable.

To facilitate testing, a high speed input is provided. Voltage doubler or tripler LCD drive options are available, and all display and setting operations are controlled by only two inputs, the Display input and the Set input. The circuit also features an automatic four year calendar.

Silicon gate ion-implanted CMOS technology is used to obtain extremely low operating power and small circuit size.

S11011**MULTIFUNCTION PROGRAMMABLE LCD WATCH**

- Six Functions (Hours/Minutes, Seconds, Month/Date/Day)
- Alphanumeric Day Display
- 12 or 24-hour Display
- Automatic Four Year Calendar
- Date and PM Annunciators
- 4-Digit Display
- Single 1.5-volt Battery
- Voltage Doubler (3.0 V) or Tripler (4.5 V) for LCD Drive
- One Pushbutton Control of Display
- Options: Chronometer, or Second Time Zone, or Alarm Function

The S11011 is the first in a series of "standard" mask programmable watch circuits. Although features, such as setting sequence, display, etc., are completely mask programmable in this family, the S11011 is preprogrammed as a six-function alphanumeric watch with selectable chronometer, alternate time zone, or alarm functions (any one of these options can be selected by bonding pad connections).

This low power timekeeping circuit uses a single 1.5-volt battery to generate the direct drive signals for the field-effect liquid crystal display. Hours and minutes, or seconds, can be displayed continuously. Month and date are displayed when the display button is depressed. A continuous display alternating between hours/minutes and month-date is also selectable. Date and PM annunciators are included.

ADVANCED PRODUCT DESCRIPTION (Available 1st Qtr. 1977)

Selection Guide-LCDs

Device No.	Description	Application	Compatible Circuit
D8130A Series (formerly S23570)	A 3½-digit, 3-Volt display suitable for use in men's watches. Special-order options available: • Thinner glass version • Custom artwork	Watch	S1408 S1424A
D8135 A Series (formerly S23590)	A 3½-digit, 3-Volt display suitable for use in men's watches. Special-order options available: • Thinner glass version • Custom artwork	Watch	S1408-9 S1424A S1426A
D8137A Series (formerly S23610)	A 5½-digit, 3-Volt display suitable for use in men's watches. Special-order options available: • Thinner glass version • Custom artwork	Watch	
D8141A Series (formerly S23620)	A 5½-digit, 3-Volt display with "Date" and "Sec" annunciators, suitable for use in men's watches. Special order options available: • Thinner glass version • Custom artwork	Watch	Nortec 5022 Micropower MPS7125
D8143 A Series	A <i>proposed</i> ladies 3½-digit watch display.	Watch	
D8145A Series (formerly S23652)	A very popular glass size for 3½-digit watch display. The glass size is the prime industry standard, and will be used for several new digit configurations. Special order options available: • Thinner glass version • Custom artwork	Watch	S1408 S1424A
D8151A Series	A 3½-digit display with extremely large digits in a popular-sized display package. Special order option available: • Custom artwork	Watch	S1408 S1424A
D8154A Series	A 4-digit alphanumeric watch display with annunciators in a very popular glass size, destined to become an industry standard. Special order option available: • Custom artwork	Watch	AMI S11011 Intersil 7210
D8160A Series	A <i>proposed</i> "Uni-Sex" sized display that could be used in either a man's or ladies' watch.	Watch	S1408, S1424A
D8300A Series	A 5½-digit clock display with "Date" and "Sec" annunciators, packaged in a popular glass size, with a primary digit height of 0.7 in.	Clock	Nortec 5022 Micropower MPS7125
D8301A Series	A 3½-digit combination clock/instrument display, packaged in a popular glass size, with a digit height of 0.5 in.	Clock/ Instrument	S1408, S1424A
D8302A Series	A 3½-digit clock display with "AM/PM" annunciators, packaged in a popular glass size, with a digit height of 1.1 in.	Clock	S1408, S1424A

Future Products-LCDs

24-hour Clock Displays
 Alphanumeric Clock Displays
 4½-digit Instrument Displays
 Calculator Displays

The displays shown below are designed for use with standard conductive elastomer connectors. In the First quarter of 1977 we will make displays available with lead frame pins for direct plug-in capability.*

D8301A Series



D8300A Series



D8302A Series



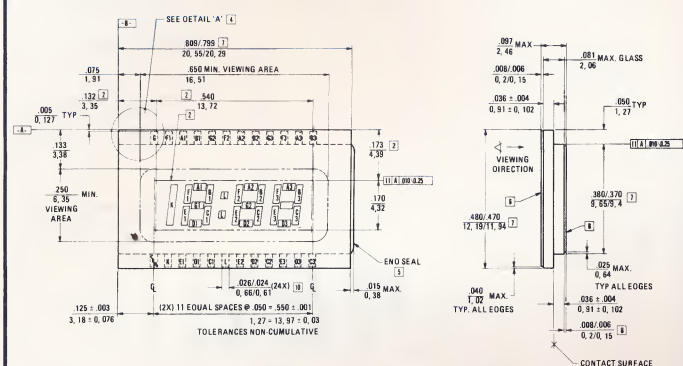
25

Watch Displays

The drawings on this page represent some of the more popular watch display configurations made by AMI. For other displays (listed in the Selection Guide on page 24) and detailed specifications request data sheets from your nearest AMI Sales Office.

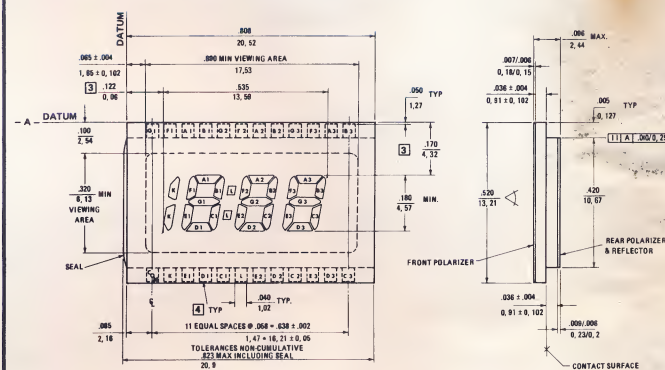
All AMI watch displays utilize highly stable moisture insensitive liquid crystal materials and all will operate reliably at 3 V ac drive.

D8135A Series



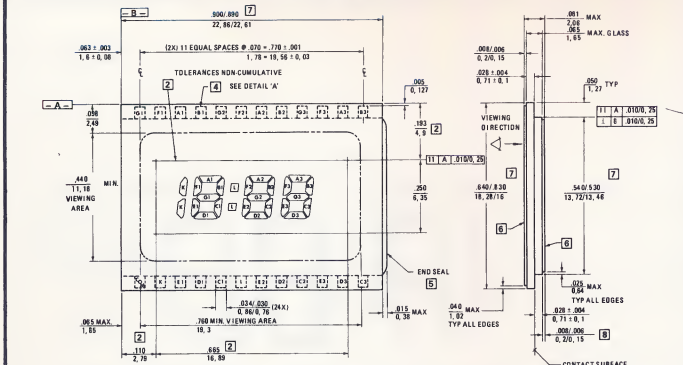
MINIMUM VIEWING AREA: 0.650 in x 0.250 in

D8145A Series



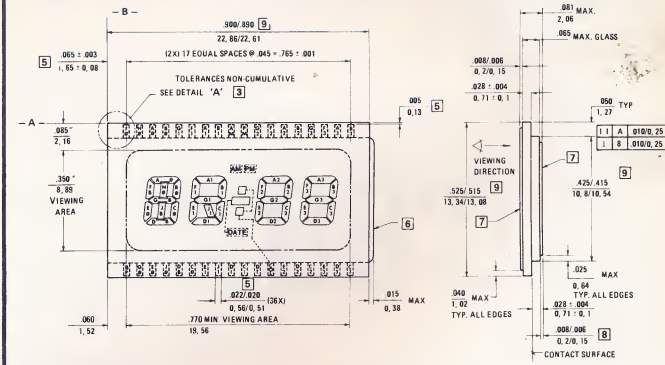
MINIMUM VIEWING AREA: 0.690 in x 0.320 in

D8151A Series



MINIMUM VIEWING AREA: 0.760 in x 0.440 in
(Digit Size 0.250 in)

D8154A Series



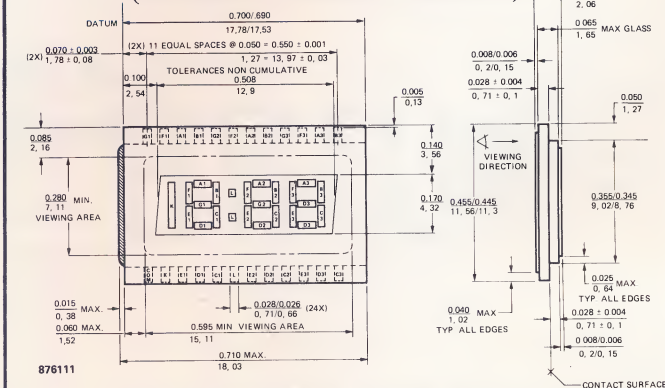
MINIMUM VIEWING AREA: 0.770 in x 0.350 in
(Digit Size 0.164 in)

AMI CUSTOM LCD DISPLAYS

AMI Display Systems has full design and manufacturing capabilities for custom LCD displays and welcomes your inquiries. Our applications engineering staff is prepared to assist in defining your display needs and then will design original artwork according to your digit configuration, display size and reflector (if needed) requirements. Our manufacturing facilities can handle large or small production runs, under rigid quality assurance controls.

Contact AMI Display Systems Marketing Department for further information.

D8160 Series (PROPOSED "UNISEX" DISPLAY)



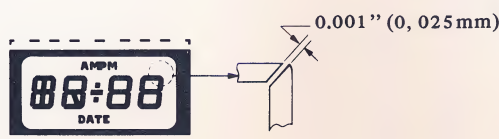
MINIMUM VIEWING AREA: .595 in x .280 in

AEA Process Displays

AMI Display Systems has introduced a new LCD manufacturing technique that dramatically improves the aesthetics of liquid crystal watch displays. This technique — the AEA Process — eliminates the need for a large gap (0.004 to 0.008 in) between adjoining segments of seven segment displays and instead, yields displays with only a 0.001 in space. It is a state-of-the-art proprietary process that allows AMI to manufacture watch displays far superior in this viewing quality to any others in the industry.

At a time when LCD watches are rapidly growing in popularity and many new models are appearing, AEA Process Displays can significantly enhance the appearance of your ladies and men's watches.

AMI can deliver these new high quality AEA Process Displays in watch-size displays described in this catalog, with any number of standard or custom digits and annunciators.



When the display is energized, segments appear to the eye to be continuous instead of broken.

Prototype Fee and Delivery Information:

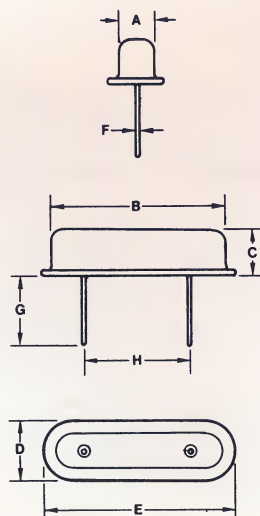
Existing AMI Glass Size and Pin-outs, Custom Digit Artwork	\$1,200.00
Existing AMI Glass Size, Custom Pin-outs and Digit Artwork	\$1,800.00

Custom Glass Size and Artwork	\$7,000.00
(All prices are based on a minimum of 10 sample units)	
Delivery Time to First Samples: minimum 6 weeks, maximum 9 weeks	

Quartz Crystals-32 KHz

S23200 Series, S23210 Series, Model S23221 — The S23200 Family of quartz crystals is basically an X-Y flexure design, but with the added feature of *four-point suspension* for the quartz element, that provides maximum resistance to shock and vibration.

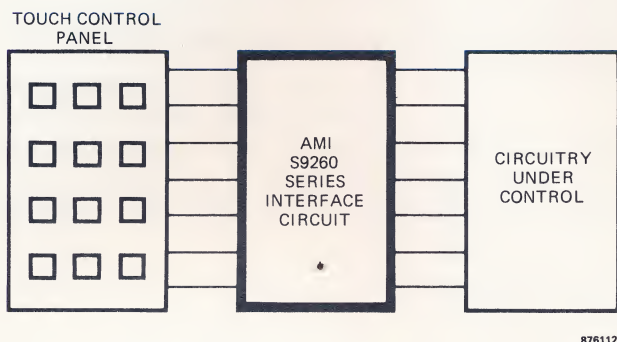
This family of 32 KHz devices can be provided in three basic frequency tolerance classifications: ± 30 ppm (parts per million); ± 50 ppm; ± 100 ppm correlated to a certain C_L (load capacitance).



DIM.	INCHES	mm
A — MAX	*0.120	3.05
B — MAX	0.472	11.99
C — MAX	0.123	3.12
D — MAX	0.170	4.32
E — MAX	0.520	13.21
F — MAX	**0.013	0.33
G — MIN	0.180	4.57
H — NOM	0.289	7.34

*Max. 0.125 with dot mark
 **Max. 0.015 with solder

TouchControl Interface Circuits



876112

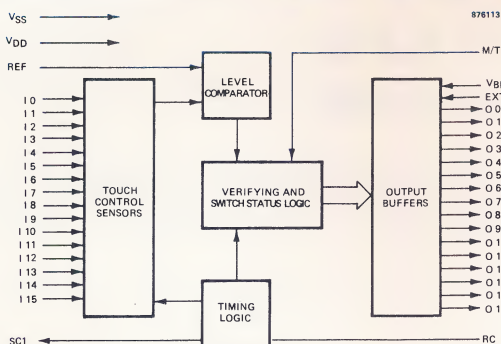
APPLICATIONS

- Appliances
- Clocks
- Light Dimmers
- Hi Fi Systems
- Timer
- Television
- Intercom System
- Tape Recorder
- Automotive Controls
- Telephone
- Computers
- Calculators
- Instrumentation
- Juke Boxes
- Vending Machines

The TouchControl Concept. TouchControl panels replace mechanical switches with non-moving electronically sensitive glass (or other material) panels that respond to the touch of a finger. The most apparent advantage of TouchControl is the visual appeal of a flat keyboard, which may be designed in a wide variety of patterns and colors. In addition to the advanced styling features, TouchControl also offers several practical benefits, such as the reliability of non-moving electronic controls and electrical isolation of the entire switch area. TouchControl also provides safety advantages, complete moisture proofing, and ease of cleaning. Contact your nearest AMI Sales Office for additional information about the TouchControl concept.

The AMI S9260 Series MOS circuits are designed to interface with a variety of TouchControl panels. These panels may be made of glass or other dielectric material (they can also be printed circuit boards) and contain the touch switch areas on the front surface. The S9260 circuits interface with the capacitive surfaces located on the back of the touch panel. Open drain outputs of the S9260 circuits allow easy driving of TTL, CMOS, PMOS, or discrete circuitry. There are seven different circuits in the S9260 family and they can interface variously with up to 32 TouchControl Switches.

S9260/S9261/S9263/S9264/S9265



(S9263 Block Diagram)

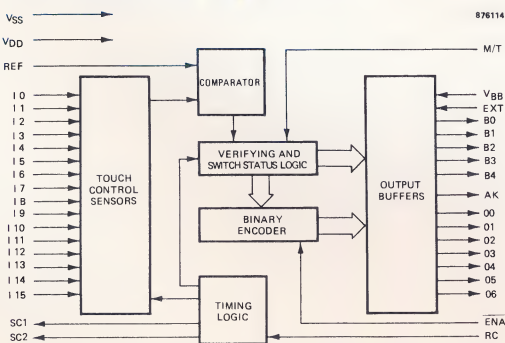
TOUCHCONTROL INTERFACE

These TouchControl interface circuits can be connected to either seven (S9260/S9261) or sixteen (S9263/S9264/S9265) touch switches. For each switch input, there is a corresponding separate output. The outputs are open drain with their sources connected in common to supply input VBB. This permits the driving of TTL as well as MOS circuits, by varying the VBB voltage.

The M/T input controls operation of the outputs. In the momentary mode (M), an output is active only while the touch switch is being activated (touched by the operator). In the toggle mode (T), alternate actuations of a touch switch will cause its associated output to latch either on or off. On the S9260 and S9263, the M/T input affects all outputs. On the S9261, S9264, and S9265, several switch inputs are permanently fixed in the momentary mode, thus allowing both momentary and toggle switch actuation to be implemented simultaneously.

ADVANCED PRODUCT DESCRIPTION
(Available 4th Qtr. 1976)

S9262/S9266



(S9266 Block Diagram)

MULTIPLEXED TOUCHCONTROL INTERFACE

Both circuits multiplex the inputs to increase the number of TouchControl switches to which each circuit can connect. All scanning is performed by the internal circuitry with an external RC network used to establish the frequency.

The S9262 can connect to a 2 x 7 switch matrix to interface with 14 TouchControl switches. The S9262 outputs are encoded in binary on four pins. The S9266 can connect to a 2 x 16 switch matrix to interface with 32 TouchControl switches. Outputs are encoded in binary on five pins. An enable input is provided to allow use of several circuits in one system.

All outputs are open drain with the sources connected to the VBB input. This allows easy driving of TTL, CMOS, PMOS, or discrete circuitry.

ADVANCED PRODUCT DESCRIPTION
(Available 4th Qtr. 1976)

AMERICAN MICROSYSTEMS, INC.

5305

TERMS OF SALE

1. **ACCEPTANCE:** THE TERMS OF SALE CONTAINED HEREIN APPLY TO ALL QUOTATIONS MADE AND PURCHASE ORDERS ENTERED INTO BY THE SELLER. SOME OF THE TERMS SET OUT HERE MAY DIFFER FROM THOSE IN BUYER'S PURCHASE ORDER AND SOME MAY BE NEW. THIS ACCEPTANCE IS CONDITIONAL ON BUYER'S ASSENT TO THE TERMS SET OUT HERE IN LIEU OF THOSE IN BUYER'S PURCHASE ORDER. SELLER'S FAILURE TO OBJECT TO PROVISIONS CONTAINED IN ANY COMMUNICATION FROM BUYER SHALL NOT BE DEEMED A WAIVER OF THE PROVISIONS OF THIS ACCEPTANCE. ANY CHANGES IN THE TERMS CONTAINED HEREIN MUST SPECIFICALLY BE AGREED TO IN WRITING BY AN OFFICER OF THE SELLER BEFORE BECOMING BINDING ON EITHER THE SELLER OR THE BUYER. All orders or contracts must be approved and accepted by the Seller at its home office. These terms shall be applicable whether or not they are attached to or enclosed with the products to be sold or sold hereunder. Prices for the items described above and acknowledged hereby are firm and not subject to audit, price revision, or price redetermination.

2. **PAYMENT:**

(a) Unless otherwise agreed, all invoices are due and payable thirty (30) days from date of invoice. No discounts are authorized. Shipments, deliveries, and performance of work shall at all times be subject to the approval of the Seller's credit department and the Seller may at any time decline to make any shipments or deliveries or perform any work except upon receipt of payment or upon terms and conditions or security satisfactory to such department.

(b) If, in the judgment of the Seller, the financial condition of the Buyer at any time does not justify continuation of production or shipment on the terms of payment originally specified, the Seller may require full or partial payment in advance and, in the event of the bankruptcy or insolvency of the Buyer or in the event any proceeding is brought by or against the Buyer under the bankruptcy or insolvency laws, the Seller shall be entitled to cancel any order then outstanding and shall receive reimbursement for its cancellation charges.

(c) Each shipment shall be considered a separate and independent transaction, and payment therefor shall be made accordingly. If shipments are delayed by the Buyer, payments shall become due on the date when the Seller is prepared to make shipment. If the work covered by the purchase order is delayed by the Buyer, payments shall be made based on the purchase price and the percentage of completion. Products held for the Buyer shall be at the risk and expense of the Buyer.

3. **TAXES:** Unless otherwise provided herein, the amount of any present or future sales, revenue, excise or other taxes, fees, or other charges of any nature, imposed by any public authority, (national, state, local or other) applicable to the products covered by this order, or the manufacturer or sale thereof, shall be added to the purchase price and shall be paid by the Buyer, or in lieu thereof, the Buyer shall provide the Seller with a tax exemption certificate acceptable to the taxing authority.

4. **F.O.B. POINT:** All sales are made F.O.B. point of shipment. Seller's title passes to Buyer, and Seller's liability as to delivery ceases upon making delivery of material purchased hereunder to carrier at shipping point, the carrier acting as Buyer's agent. All claims for damages must be filed with the carrier. Shipments will normally be made by Parcel Post, Railway Express, Air Express, or Air Freight. Unless specific instructions from Buyer specify which of the foregoing methods of shipment is to be used, the Seller will exercise his own discretion.

5. **DELIVERY:** Shipping dates are approximate and are based upon prompt receipt from Buyer of all necessary information. In no event will Seller be liable for any re-procurement costs, nor for delay or non-delivery, due to causes beyond its reasonable control including, but not limited to, acts of God, acts of civil or military authority, priorities, fires, strikes, lock-outs, slow-downs, shortages, factory or labor conditions, errors in manufacture, and inability due to causes beyond the Seller's reasonable control to obtain necessary labor, materials, or manufacturing facilities. In the event of any such delay, the date of delivery shall, at the request of the Seller, be deferred for a period equal to the time lost by reason of the delay.

In the event Seller's production is curtailed for any of the above reasons so that Seller cannot deliver the full amount released hereunder, Seller may allocate production deliveries among its various customers then under contract for similar goods. The allocation will be made in a commercially fair and reasonable manner. When allocation has been made, Buyer will be notified of the estimated quota made available.

6. **PATENTS:** The Buyer shall hold the Seller harmless against any expense or loss resulting from infringement of patents, trademarks, or unfair competition arising from compliance with Buyer's designs, specifications, or instructions. The sale of products by the Seller does not convey any license, by implication, estoppel, or otherwise, under patent claims covering combinations of said products with other devices or elements.

Except as otherwise provided in the preceding paragraph, the Seller shall defend any suit or proceeding brought against the Buyer, so far as based on a claim that any product, or any part thereof, furnished under this contract constitutes an infringement of any patent of the United States, if notified promptly in writing and given authority, information, and assistance (at the Seller's expense) for defense of same, and the Seller shall pay all damages and costs awarded therein against the Buyer. In case said product, or any part thereof, is, in such suit, held to constitute infringement of patent, and the use of said product is enjoined, the Seller shall, at its own expense, either procure for the Buyer the right to continue using said product or part, replace same with non-infringing product, modify it so it becomes non-infringing, or remove said product and refund the purchase price and the transportation and installation costs thereof. In no event shall Seller's total liability to the Buyer under or as a result of compliance with the provisions of this paragraph exceed the aggregate sum paid by the Buyer for the allegedly infringing product. The foregoing states the entire liability of the Seller for patent infringement by the said products or any part thereof. THIS

PROVISION IS STATED IN LIEU OF ANY OTHER EXPRESSED, IMPLIED, OR STATUTORY WARRANTY AGAINST INFRINGEMENT AND SHALL BE THE SOLE AND EXCLUSIVE REMEDY FOR PATENT INFRINGEMENT OF ANY KIND.

7. **INSPECTION:** Unless otherwise specified and agreed upon, the material to be furnished under this order shall be subject to the Seller's standard inspection at the place of manufacture. If it has been agreed upon and specified in this order that Buyer is to inspect or provide for inspection at place of manufacture such inspection shall be so conducted as to not interfere unreasonably with Seller's operations and consequent approval or rejection shall be made before shipment of the material. Notwithstanding the foregoing, if, upon receipt of such material by Buyer, the same shall appear not to conform to the contract, the Buyer shall immediately notify the Seller of such conditions and afford the Seller a reasonable opportunity to inspect the material. No material shall be returned without Seller's consent. Seller's Return Material Authorization form must accompany such returned material.

8. **WARRANTY:** The Seller warrants that the products to be delivered under this purchase order will be free from defects in material and workmanship under normal use and service. Seller's obligations under this Warranty are limited to replacing or repairing or giving credit for, at its option, at its factory, any of said products which shall, within one (1) year after shipment, be returned to the Seller's factory of origin, transportation charges prepaid, and which are, after examination, disclosed to the Seller's satisfaction to be thus defective. THIS WARRANTY IS EXPRESSED IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, STATUTORY, OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON THE SELLER'S PART, AND IT NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR THE SELLER ANY OTHER LIABILITIES IN CONNECTION WITH THE SALE OF THE SAID ARTICLES. This Warranty shall not apply to any of such products which shall have been repaired or altered, except by the Seller, or which shall have been subjected to misuse, negligence, or accident. The aforementioned provisions do not extend the original warranty period of any product which has either been repaired or replaced by Seller.

It is understood that if this order calls for the delivery of semiconductor devices which are not finished and fully encapsulated, that no warranty, statutory, expressed or implied, including the implied warranty of merchantability and fitness for a particular purpose, shall apply. All such devices are sold as is where is.

9. **GENERAL:**

(a) The validity, performance and construction of these terms and all sales hereunder shall be governed by the laws of the State of California.

(b) The Seller represents that with respect to the production of articles and/or performance of the services covered by this order it will fully comply with all requirements of the Fair Labor Standards Act of 1938, as amended, Williams-Steiger Occupational Safety and Health Act of 1970, Executive Orders 11375 and 11246, Section 202 and 204.

(c) In no event shall Seller be liable for consequential or special damages.

(d) The Buyer may not unilaterally make changes in the drawings, designs or specifications for the items to be furnished hereunder without Seller's prior consent.

(e) Except to the extent provided in Paragraph 10, below, this order is not subject to cancellation or termination for convenience.

(f) Buyer acknowledges that all or part of the products purchased hereunder may be manufactured and/or assembled at any of Seller's facilities, domestic or foreign.

(g) In the event that the cost of the products are increased as a result of increases in materials, labor costs, or duties, Seller may raise the price of the products to cover the cost increases.

(h) If Buyer is in breach of its obligations under this order, Buyer shall remain liable for all unpaid charges and sums due to Seller and will reimburse Seller for all damages suffered or incurred by Seller as a result of Buyer's breach. The remedies provided herein shall be in addition to all other legal means and remedies available to Seller.

10. **GOVERNMENT CONTRACT PROVISIONS:** If Buyer's original purchase order indicates by contract number, that it is placed under a government contract, only the following provisions of the current Armed Services Procurement Regulation are applicable in accordance with the terms thereof, with an appropriate substitution of parties, as the case may be — i.e., "Contracting Officer" shall mean "Buyer", "Contractor" shall mean "Seller", and the term "Contract" shall mean this order:

7-103.1, Definitions; 7-103.3, Extras; 7-103.4, Variation in Quantity; 7-103.8, Assignment of Claims; 7-103.9, Additional Bond Security; 7-103.13, Renegotiation; 7-103.15, Rhodesia and Certain Communist Areas; 7-103.16, Contract Work Hours and Safety Standards Act — Overtime Compensation; 7-103.17, Walsh-Healey Public Contracts Act; 7-103.18, Equal Opportunity Clause; 7-103.19, Officials Not to Benefit; 7-103.20, Covenant Against Contingent Fees; 7-103.21, Termination for Convenience of the Government (only to the extent that Buyer's contract is terminated for the convenience of the government); 7-103.22, Authorization and Consent; 7-103.23, Notice and Assistance Regarding Patent Infringement; 7-103.24, Responsibility for Inspection; 7-103.25, Commercial Bills of Lading Covering Shipments Under FOB Origin Contracts; 7-103.27, Listing of Employment Openings; 7-104.4, Notice to the Government of Labor Disputes; 7-104.11, Excess Profit; 7-104.15, Examination of Records by Comptroller General; 7-104.20, Utilization of Labor Surplus Area Concerns.

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